

**(12) PATENT APPLICATION**  
**(19) AUSTRALIAN PATENT OFFICE**

**(11) Application No. AU 200030126 A1**

(54) Title  
**Improvements in locks**

(51)<sup>7</sup> International Patent Classification(s)  
**E05B 065/08**

(21) Application No: **200030126**

(22) Application Date: **2000.04.27**

(43) Publication Date : **2001.04.26**

(43) Publication Journal Date : **2001.04.26**

(62) Divisional of:  
**200018474**  
**200018474**

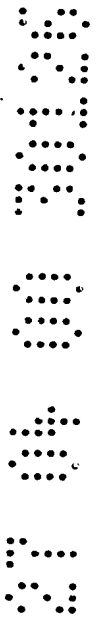
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**ABSTRACT**

- 5 A lock including a rectilinearly moveable engaging slide and a stud, the said slide and stud automatically engaging under the action of a spring when each in relation to the other is within a pre-determined range of positions



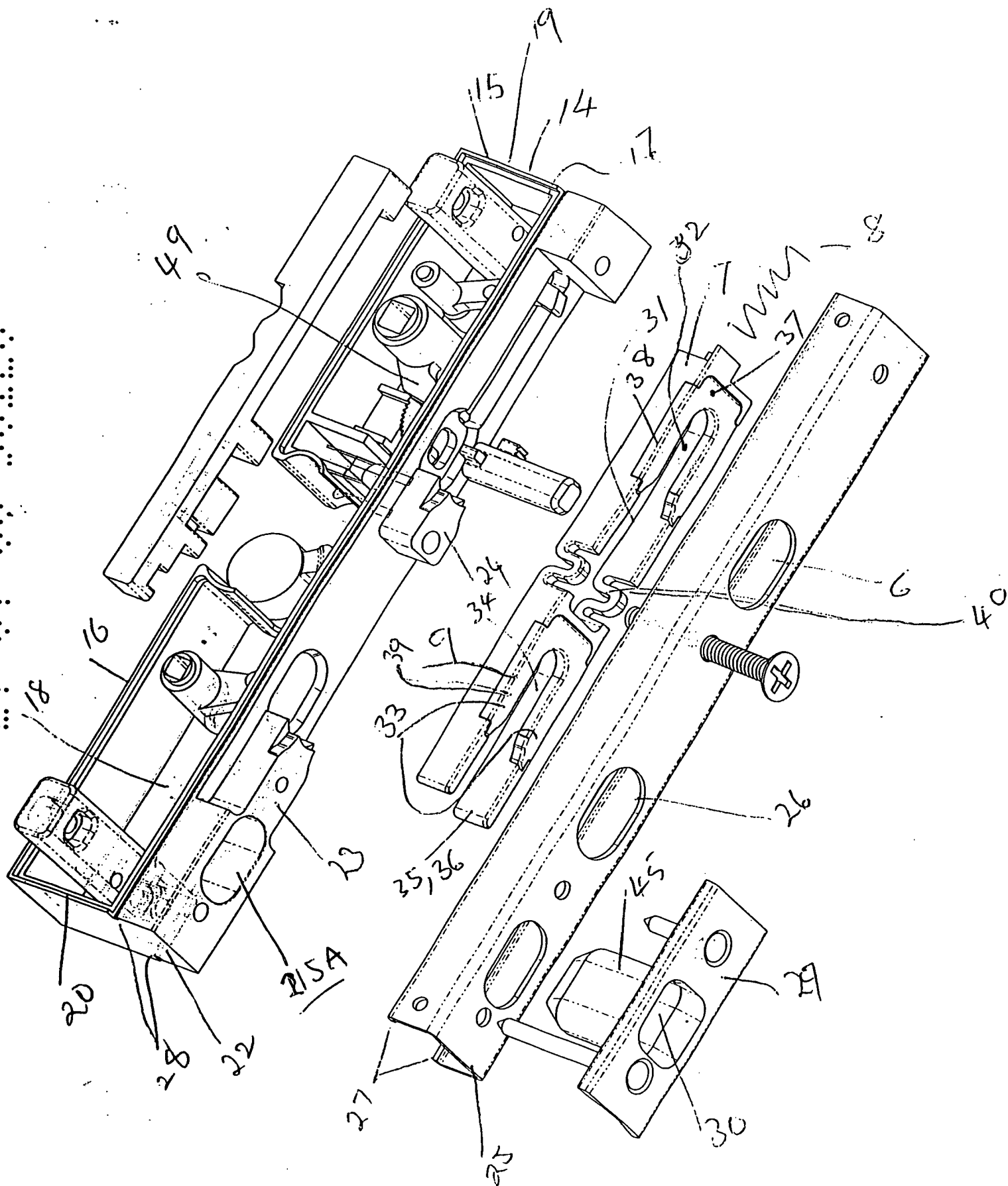


FIG 3

AUSTRALIA

Patents Act 1990

**ORIGINAL  
COMPLETE SPECIFICATION  
STANDARD PATENT**

Invention Title:

*Improvements in Locks*

The following statement is a full description of this invention, including the best method of performing it known to me:-

IP Australia

Documents received on:

27 APR 2000

Batch No:

Melbourne

5

**Title:**

Improvements in Locks

**Summary of the Invention**

10 According to the invention there is provided:

A lock lockable exteriorly by a first hand operable member but not unlockable by the said first hand opeable member

15 A lock including a casing, one or more moveable forks and headed studs attached in useage to an element defining part of a door opening, said forks being moveable to locate behinds the heads of the studs to retain the heads within the casing.

20 A lock for a wing comprising a casing of a first box-like portion connected to an elongated channel

25 A lock for a moveable wing, including a cylinder and a casing wherein the rear wall of the cylinder is omitted to place the cylinder as far from the front edge of the casing as is possible

30 A lock including handle sets mountable on both sides of a door and including means of urging the handle sets towards the door to tighten them including a recess with an angled wall and a wedge shaped member.

A lock for a moveable wing, including handle sets each including a hand operable member and a recess for a double cylinder, the handle operable members being interchangeable to effect a different locking functionality

35 A lock wherein the handle sets comprise a D shaped handle with a lever operable in the opening direction of of the door.

40 A lock including a casing, a key operable cylinder having a rotateable armed cam and a locking slide wherein the locking slide is moveable by key operation to effect a locking function, said arm of the cylinder cam locating between shoulders of the locking slide which thereby define therebetween a cam recess, one of the said shoulders comprising part of a slide member supported by the locking slide and maintained within a range of limited movement by a spring

45 A multipoint lock including, a key operable cylinder and/or hand operable member, at least one moveable fork, at least one engageable stud and at least one remote lock wherein when the fork and stud are adjacent in a predisposed position, the cylinder and/or hand operable may be operated to  
50 actuate the remote lock.

5 A remote lock for a door comprising means to mount the lock in relation to studs mounted to an element defining part of a door opening and a moveable slide having an aperture permitting the passage of the heads of the studs connected to an aperture of reduced width defined by side shoulders between which the heads cannot pass.

10 A lock including a rectilinearly moveable engaging slide and a stud, the said slide and stud automatically engaging under the action of a spring when each in relation to the other is within a pre-determined range of positions

A lock where the lock body and catch plate are engageable within a range of positions defined by an alignment pin

15 A lock wherein the engaging means comprises a hooked member and slide mean

20 A lock wherein the locking means includes at least one slide of slide means and the engaging means comprises a hooked member wherein in the first and second locked configuration the hooked member is restrained from movement by the slide of the slide means

25 A lock including locking means and engaging means and means to restrict operation of the locking means until the engaging means is operative

A lock including a key operable cylinder, said lock being unlockable by operation of the cylinder

30 A lock unlockable interiorly by a second hand operable member

A lock lockable and unlockable exteriorly and interiorly by operation of a double cylinder

35 A lock wherein the first hand operable member comprises a rotateable member having a slotted aperture and requiring the insertion of a key or the like for operation, the said member being inaccessible for hand operation otherwise.

40 A lock wherein the forks automatically engage the studs when the door is moved in a closing direction

45 A lock wherein the lock forks are engageable with the studs to engage the studs to retain the door in a closed position said lock providing engagement when the studs are displaced vertically within upper and lower limits from an ideal position in relation to the casing

50 A lock wherein the recesses within the casing which permit the passage of studs and the recesses in the forks to engage the heads are all elongated to accommodate engagement in multiple positions within the said limits

A lock wherein the forks comprise metal parts supported in a latch-slide which is moveable by spring biasing means so that the forks engage the studs

A lock wherein the latch-slide is a resilient member

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A lock including detent means wherein the latch-slide and carried forks are restrained in a disengageable and disengaged position until the lock casing is in a pre-determined position relative to the element defining part of the door opening at which time the detent is rendered inoperative.

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A lock including a drive cam supported in the casing said cam having an arm moveable upwardly to displace the latch-slide against biasing means to the disengaged position, said detent in operation restricting movement of the drive cam to restrain the latch-slide from moving to the engageable or engaged position.

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A lock including a toothed rocker member operably coupled to the drive cam and a toothed outwardly biased auxiliary bolt such that depression of the auxiliary bolt by a stud head causes its geared portion to release the geared portion of the rocker member which otherwise would remain engaged by the auxiliary bolt to enable the latch-slide to be moved to the engaged position

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A lock wherein the studs are outwardly adjustable by rotation but may not be significantly rotated when engaged in the lock body.

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A lock including an alignment pin to maintain and guide the lock casing in relation to the studs

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A lock for a door having a pear-shaped euro cylinder located in an oval recess on the face of the handle sets and substantially at the vertical centre of the handle sets.

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A lock including a deadlocking slide operable by an interior or exterior hand operable member or by an exterior cylinder or by an interior operable cylinder whereby the latch-slide is driveable to a limit of its movement in a locking direction.

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A lock according to wherein the apertures include a raised cupped wall to facilitate stud head removal.

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A lock including a deadlocking slide and a geared pinion supported by the casing said pinion being operably coupled to the deadlocking slide, and drive slides having rack portions mating with the pinion one on each side and being of extended length so that one protrudes from the top of the casing while one protrudes from the bottom to operate upper and lower remote lock respectively, wherein movement of the drive slide during lock operation operates the remote locks

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A lock wherein movement of the locking slide causes greater movement of the engaging slide and drive slides

A lock wherein the deadlocking slide meshes with a geared portion of the pinion of reduced diameter.

- 5 A lock including counteracting means operable by movement of the locking slide and by which remote locks may be operated

- 10 A lock including points of attachment for rods connected to remote locks these points of attachment moving simultaneously with the locking slide but relatively proportionally more.

A lock including co-acting means operable by movement of the locking slide and by which remote locks may be operated

- 15 A lock including points of attachment for rods connected to remote locks these points of attachment moving simultaneously with the locking slide but relatively proportionally more.

- 20 A lock according to any of the above claims including a triggered latch bolt

A lock including a relatively displaceable triggered latch bolt

A lock for a sliding door according to any of the above claims

- 25 A lock for a hinged door according to any of the above claims

A lock for a window according to any of the above claims

- 30 A lock having a sliding triggered latch bolt and a sliding bolt operable by a cylinder

A lock including a catch plate having biasing means to accommodate relative movement.

- 35 A lock having a catch plate having biasing means to effect fastening

A lock substantially as described herein with reference to and as illustrated in the accompanying drawings.

40 **Drawings**

Embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

Fig 1 is a schematic side view of a lock body having a latch-slide

- 45 Fig 2 is a schematic side view of a catch plate applicable to the embodiment of Fig 1

Fig 3 is an exploded isometric view of the lock body of Fig 1

Fig 4 is a solid model of Fig 3

Fig 5 is a schematic side view of the lock body of Fig 1 without the casing

- 50 Fig 6 is an exploded isometric view of Fig 5

Fig 7 is a schematic side view of the locking means – in the undisplaced position

Fig 8 is a schematic side view of the locking means – in the “second locked configuration”

5 Fig 9 is a schematic side view of the locking means – in the “first locked configuration”

Fig 10 is a schematic side view of a handle set applicable to an embodiment having a latch-slide

Fig 11 is a schematic view of a snib mechanism

10 Fig 12 is a schematic top view of a handle assembly

Fig 14 is a schematic isometric view of components of an embodiment of the locking-snib

Fig 15 is an exploded isometric view of part of the underside of the handle assembly showing the locking-snib of Fig 14

15 Fig 16 is an exploded isometric view of part of the underside of the handle assembly showing an alternative locking-snib mechanism

Fig 18 schematic side view of the detent means of an embodiment having a latch-slide

20 Fig 19 schematic side view of the components used to operate in a remote lock and of a snib mechanism which includes a geared cam

Fig 20 is schematic views of a remote lock

Fig 21 is a schematic side view of a lock body of an embodiment including a hooking latching arm

Fig 22 is a front view of the lock of Fig 21

25 Fig 23 is a schematic side view of a handle assembly adapted to suit the lock of Fig 22

Fig 24 is a schematic partial side view of a lock body of an embodiment of the invention which is the same as that shown in Fig 21 except for the substituted aspects shown in Fig 24; these being a triggered sliding latch bolt to replace the pivotal hooking member, a single engaging fork; and a push-in pin to replace a pivotal arm to restrict locking of the lock unless the catch plate is engaged, the lock is shown in a configuration prior to latching,

Fig 25 shows the lock of Fig 24 at unlatching,

Fig 26 shows the lock of Fig 24 in the latched configuration

35 Fig 27 is an enlarged partial view of Fig 24

### Description of the Preferred Embodiments

The current invention is an improved invention of the inventions described in co-pending Australian Applications:

40 15295/00 of February 10, 2000

17563/00 of February 18, 2000, and

18474/00 of February 22, 2000

which are herein incorporated by reference. Drawings are numbered as in 18474 with the numbers relating to improvements described only herein

45 commencing at 2xx.

Relevant provisional patents are: PQ4429, PQ4146, PQ3644, PP8866, PP8836, PP8809 and PP8610

The invention comprises a lock for a moveable wing. Moveable wings well suited to the lock include a sliding security door, sliding window or sliding patio glass door constructed from aluminium extrusions and having a vertical hollow extrusion on the lock edge of the door.

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In summary the lock, (described for convenience as fitted to a door), comprises operable **handle sets 1** including operable **levers 2** mounted on the interior face of the door and the exterior face of the door, a **lock body 3** mounted within the door frame between the handle sets and a **catch plate 4** mounted to an **element** comprising part of the door opening - the catch plate having one or more **headed studs 5** which protrude from a backing plate to be engageable by the lock body.

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The headed studs may alternatively fasten into a sleeve nut attached to the element - the sleeve nut comprising a disc like portion which is integrally connected to an externally threaded shank and which along its longitudinal axis is internally threaded such as to mate with threaded engagement with the stud shank. In practise the nut shank would be passed through a mating aperture in the element comprising part of the door opening to be secured in place by a hex or other common nut. The stud would then be threadedly inserted into the nut and adjusted horizontally inwardly or outwardly to suit the lock.

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(The element comprising part of the opening being, for example, a vertical door jamb member or part of an aluminium frame surrounding the opening. Importantly, the catch plate and lock body engage when the door is closed to retain the door in a closed position adjacent the element and therefor in relation to the element)

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The lock operates generally in the following manner:

In an embodiment Fig 1 and 2, as the door is brought to the closed position the studs pass into **recesses 6** within the face of the lock and a **engaging-slide 7** biased by **spring 8** is released so that **forks 9** of the engaging-slide pass behind the **heads 10** of the studs 5 to capture the heads within the lock - the lock therefor including latching ability since engagement occurs automatically under the action of a spring and in this embodiment the engaging-slide may be said to comprise a latch-slide. The operating lever 2, Fig 10 in either handle set may be operated to lift the engaging-slide to release the studs of the catch plate.

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In another embodiment where the catch plate includes a **hooked pin 201**, as the door is brought to the closed the **ramped end 202** of a **hooking arm 203** is displaced (from an undisplaced position) upwardly on contact with the **leading end 204** of the hooked pin. The hooking arm is biased by **spring 205** towards the undisplaced position so when a **shoulder 206** adjacent the ramped end is moved relatively by the closing of the door to be adjacent a **recess 207** in the upper side of the hooked pin the spring moves the hooking arm towards the pin to effect engagement by dint of the shoulder 106 locating in recess 107 adjacent a **recess wall 208** - the lock therefor including latching capability since engagement occurs automatically under the action of a spring.

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The operating lever 2 , Figure 23 in either handle set may be operated to lift the engaging-slide to release the studs of the catch plate.

5 In a preferred embodiment, there is a hand operable "snib" lever or knob having associated mechanism (not shown but as described in Australian Pat. 706589 and which is herein included by reference) within the interior handle set which may be operated to lock the lock to thereby prevent the catch plate from being released and a key operable cylinder may be operated from the exterior side or interior side of the door to lock the lock. Preferably there are  
10 two locked configurations of the lock::

a **first configuration** from which the lock can only be unlocked by operation of the cylinder, and

a **second configuration** from which it may be unlocked by operation of the snib or cylinder. Locking by operation of the snib, locks to the second  
15 configuration only.

In an embodiment the exterior handle set includes a hand operable **locking-snib 11**, Fig 13 to 16 (which may comprise a **recessed cylinder 12** within the body of the exterior handle set which has an accessible **slotted recess 13** in it in which the blade of a key may be inserted to operate it), by which the lock may be locked to the second configuration but not the first and which cannot  
20 unlock the lock., i.e. the locking-snib 11 in the exterior handle set can only be used to lock the lock.

25 The locking means described above, (i.e. the cylinder and exterior locking-snib and interior snib), is applicable to many types of locks including locks having sliding latch bolts which are spring biased towards their extended protruding position such as that described in Australian Pat. 706589 and Australian Patent application 77719/94 and locks for sliding doors having  
30 spring biased hooked arms which engage a hooked catch plate as the door is closed and any other lock which includes both a cylinder and an internal snib – the exterior locking-snib providing means of locking these types of locks from the exterior, to the second configuration enabling subsequent  
35 unlocking later from the interior by snib without the need to use a key

Preferably the internal snib and external – locking-snib, (lever, knob or key aperture), are interchangeable at fitting so that for doors which open in the opposite direction, they may be interchanged to convert the exterior handle set to the interior handle set and vice versa, (that is if one does not wish to  
40 operate the lock the other end up). It should also be noted that the lock herein described will function equally as well either end up which enable completed doors to be simply inverted to operate in the opposite direction

Referring to Fig 1 and 21, we see that the lock body comprises a **casing 14** comprising a box like **first casing portion 15** having a **back wall 16**, a **front wall 17**, a **first side wall 18** and a second side wall comprising a **lid** (not shown) which is attached to the balance portion of the casing and **upper and lower ends 19 and 20** which as will be discussed below, may be **apertured 21** (Fig 21) to permit passage of slides to operate an upper and lower remote  
50 lock. The casing includes a **second casing portion 22** which comprises

**casing abutments 23 and 24** (Fig 3, 4) which protrude to provide support for a rectilinearly moveable **engaging-slide 7** (which in the embodiment where this slide latchingly engages, is herein, also referred to as a **latch-slide**) and a pressed steel U shaped **channel 25** which envelops the engaging-slide and abutments to retain the engaging-slide relative to the casing – this channel having elongated **apertures 26** to permit the passage of the heads of the studs. The steel U shaped section has **returns 27** which locate behind **casing shoulders 28** along the length of both sides of the casing.

Preferably the *channel* is of steel and preferably stainless steel for added strength and because steel will deform elastically and plastically if subject to high loads but it will not crack or undergo brittle fracture which other materials may do and so the steel provides increased strength and robustness to provide increased resistance to pulling on the forks by the studs (relatively as would occur in a vigorous attempt to jimmy a locked door. The steel envelope also prevents the arms of the forks from being forced apart by the studs to release the head of the studs. The steel member is assembled to the first casing portion by sliding it on from one end of the casing.

The lock is designed so that it will correctly function if the door is situated in relation to the element comprising part of the opening, between plus and minus 4mm of a central “ideal” height and plus or minus 1mm of an “ideal” central sides-ways position. In practice this means, in relation to the catch plate which is attached to the element, that the lock will function correctly within a height range of 8 mm and a sideways range of 2 mm this being so that the limited vertical movement and sideways movement of the door relative to the opening caused by affects such as roller wear or house movement will not require adjustment of the lock and so limit after sales maintenance calls. To accommodate this range the engaging-slide must displace between end limits than it would otherwise have to.

It should be noted that the 8 mm and 2 mm dimensions refer to a specific embodiment and the invention is not restricted to such values as other dimensions are also envisaged by the invention.

Throughout the description reference is made two studs and two are shown drawn as this is the preferred number but the invention is not limited to one or two studs as other numbers are also envisaged.

To accommodate the operating ranges, (8mm and 2mm preferred), the face of the door and the **cover-plate 29**, (which is attached to the face of the door adjacent the lock body and preferably of plastic to provide a smooth bearing surface), have elongated **oval apertures 30** to accommodate the passage of stud heads within the 8 mm and 2 mm ranges and the engaging-slide likewise has **elongated apertures 31** which also permit passage of the heads over the 8mm range vertically and 2mm range laterally. Each aperture in the engaging-slide connects to an **elongated narrower slot 32** defined by parallel spaced **engaging-shoulders 33** and having a **recess 34** of increased width behind them to accommodate the stud heads. The members are dimensionally

configured such that the engaging-slide may be moved vertically downward so as to position the engaging-shoulders between the heads of the studs and the internal wall of the channel, (the shanks passing between and through the engaging -shoulders).

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In a preferred embodiment, Fig 3, 4 the engaging-slide comprises a semi-rigid **slide-base 35** comprising **side rails 36** connected by **bridges 37** and which supports **forks 38** the **arms 39** of which comprise the engaging-shoulders, said forks preferably being of hardened steel or stainless steel.

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Preferably the **base 35** has **portions 40** of reduced cross-sectional area to permit bending of the base to accommodate bending /deformation of the channel by attack and in which case the base may need to function correctly when the base face is not completely flat and so that the base may resiliently return to its original shape after it has been elastically deformed by attack on the lock or door. The forks locate and are supported within **recesses 41** (Fig 5) in the face of the slide-base. It should be noted that the head of the studs will fit with some free movement between the rails of the slide but the stud heads are too large to pass between the arms **39** of the forks while the shank of the studs will fit with clearance between the arms and within the space between the arms, ( to permit the slide-base and forks to slide vertically so as to position the heads behind the arms and in the recess 25 - in this way the catch plate including the studs, is engaged by the engaging-slide under the action of the compression spring 8 located on the top end of the engaging-slide.

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Preferably the studs, Fig 2, are threadedly engaged in the catch plate by screw **threads 42** so that they may be adjusted in and out to provide fitting adjustment. So that the studs may not be rotated and removed when the lock has engaged the catch plate, each has a **longitudinal fin 43** along the shank such that the width across the shank including the fin exceeds the distance between the arms of the fork so that while between the forks they cannot be rotated.

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In the embodiment having a latch-slide, the door and catch plate are maintained relatively in the clearance ranges 8 and 2 mm by a pointed chamfered or tapered **alignment pin 44** which preferably requires no adjustment and which protrudes further from the catch plate to first engage the door and lock as the door is slid towards the closed position. Within the face of the cover plate is an elongated **aperture 30** (the door having a matching recess) to permit passage of the pin and this apertured is surrounded by an elongated **peripheral wall 45** which acts as a bearing surface for the pin to guide the lock over the alignment pin and therefore to horizontally align the lock and headed studs, (urging the door sideways if necessary) and preventing any engagement if the lock and pins are substantially vertically misaligned. When the latch-plate is in engagement with the catch plate the engaging-slide may be lifted out of engagement by operation of either handle set lever. Each handle set has a **shaft 47**, preferably square, which engages in and mates with a **recess 48** preferably

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square in cross-section in an **operating cam 46** located in the first casing portion and supported in circular recesses in the side walls of the casing so as to be rotateable. This has a **drive arm 49** which projects forward to locates under a **bridge 50** of the engaging-slide. This portion of the mechanism is configured such that when the operating lever is in the undisplaced position and the engaging-slide is down in the engaged, latched position), the drive arm rests beneath the said bridge. Operation of either lever, in practise, causes the drive cam to rotate to drive the drive arm upwardly to lift the said engaging-slide to release the studs.

In the embodiment where latching is by a hooked arm, Fig 21 to 23, there is a **pin 201** which acts as a location pin but it locates within a cylindrical **recess 209** within a **block 210** (half of which is shown cross-hatched in Fig 22) said block being able to move vertically +4mm and -4mm within the lock casing.

The lock is configured so that this range of 8mm is consistent with the 8mm range associated with the studs and so the lock as a whole will function correctly within a vertical range of relative position of 8 mm and a horizontal relative range of 2 mm. The block preferably locates within the channel and in a **recess 215** defined by an **upper wall 214** and a **lower wall 213** in the face of the second casing portion 22 has an **upper end 214** a **lower end 213** and which may be displaced relative to the casing, by rectilinear movement between a position where the upper end 211 abuts wall 214 and a position where the lower end abutts wall 213. There is an oval aperture 216 in the channel to permit passage of the pin. (The recess 215,

Fig 22 is similar to that shown as 215A in Fig 3 but adapted to provide a substantially paralld sided stepped recess for the block to slide in) Preferably the block and recess have the form shown in Fig 21 and 22 so as to accommodate the other components while limiting the length of the casing. The towards the upper end of the block is a **slotted aperture 217** providing passage for the hooking arm 203 which engages the hooked pin when the hooked pin is within the recess 209 as shown in Fig 21. When the hooking arm is in engagement with the hooked pin of the catch plate the hooking arm may be lifted out of engagement by operation of either handle set lever. Each handle set has a **shaft 47**, preferably rectangular in cross-section, which engages with free movement in a larger **recess 48** preferably also rectangular in cross-section in an **operating cam 46** located in the first casing portion being part of the hooking arm (the hooking arm being an armed extension of the operating cam) and being supported in circular recesses in the side walls of the casing so as to be rotateable. The shaft and recess are configured so that when the block is in the downwardly disposed position (-4 mm) and the cam 46 is in an undisplaced position then displacement of a lever to a substantially fully displaced position causes the hooked arm to displaced to a disengageable position to disengage the hooked pin. Consequently when the block is in the upwardly disposed position (+ 4mm) the shaft will rotate with some free movement before contacting the cam 46 to drive the hooking arm to the same undisplaceable position. Operation of either lever, in practise, causes the drive cam to rotate to drive the hooking arm upwardly to lift the hooked end out of engagement with the hooked pin. It should be noted here that the undisplaced angular disposition of the cam and hooking arm are determined by the position of the block. Spring 205 urges the arm 203

towards the block and the underside of the arm when the hooking arm is in the undisplaced rests against a **shoulder stop 218** defining part of the recess 209 in the block. The portions are configured so that when the hooking arm is undisplaced within the block the ramped end 202 of the hooking arm runs substantially radially inwards from the peripheral wall of the cylindrical recess 209 whereby entry of the pin 201 into the said recess causes the ramped end 202 to slide up the leading end of the pin to cause it to displace upwardly away from the pin. (It should be noted that there are multiple undisplaced positions of the hooking arm since the block can be within the 8 mm range)

Alternatively the recess 48 within drive cam may be horizontally elongated and radiussed at each end while the shaft 47 may be radiussed at two opposite corners as shown in Fig 11 and having proportions as shown such that the cam 46 may be moved anti-clockwise as occurs in latching without causing the shaft 47 to rotate. Referring to drawing 11 we can see that a distance across flats  $D = 2R$  will provide for uncoupling in one relative rotational direction while an additional  $+2r$  provides for the free movement necessary to accommodate the various relative locations of the block.

Once again it should be noted that the lock will functionally equally well either end up and the reference to a particular disposition is for ease and consistency in description only.

In the embodiment where the engaging-slide comprises a latch slide it is necessary for it to be held up against urging by spring biasing means in the disengageable, disengaged position by a **slide-detent 51** described below and in Fig 5, 6 and 18, a position corresponding to the large elongated apertures in the engaging-slide being vertically aligned with the studs to permit passage of the stud heads. The detent is affected to release the engaging-slide when the door and catch plate are disposed adjacently -more particularly when the headed studs are within the recesses in the casing and between the rails of the latch-plate and the engaging-slide is otherwise unrestricted from moving. In a preferred embodiments having the latch-slide Fig 18, the detent comprises a sideways extending **pin 52** to the drive arm which fits within a radially inclined **slot 53** within a angularly displaceable **detent rocker 54** so that the rocker and drive cam are operably coupled and movement of either causes the other to rotate. This rocker preferably is mounted over a **pin 55** projecting from the side wall of the casing. Also supported within the casing is an **auxiliary bolt 56** having a **leading end 57** portion that (when undepressed) protrudes into the path of movement of a stud head, (relative to the casing since in fact the stud does not move) and which is biased outwardly by **spring 58** outwardly towards the stud. The detent rocker includes a rearwardly disposed **annular arc 59** portion having outwardly disposed **teeth 60** and which in operation pivots adjacent the auxiliary bolt while the auxiliary bolt has a **side shoulder 61** having a **toothed portion 62** projecting in a forward direction and substantially directly behind the annular arc. This portion is so configured that when the auxiliary bolt is driven to the forward position, (by the spring), the teeth of the auxiliary bolt engage the teeth of the arc preventing the drive cam from moving. When the auxiliary bolt is depressed its teeth release the arc to enable the drive

cam, (and in practice the engaging-slide), to move. In practice, after a lever has been depressed to lift the engaging-slide from an engaged position with the studs and the door is slid open while the handle is held depressed, the auxiliary bolt relatively slides forward to engage the arc and restrain the drive arm which restrains the engaging-slide, against spring bias in a disengageable up position. When the door is slid closed the head of the stud depresses, relatively, the auxiliary bolt to release the drive can and enable the engaging-slide to be driven to the engaged, engageable position by its associated spring.

In the embodiment including a hooking arm, there is a angularly displaceable **detent arm 219** supported on a **pin 220** projecting from the side wall of the casing which, in an undisplaced position, has a **forward shoulder 221** which locates within the recess 209 when the lock body is away from the catch plate. This detent arm when undisplaced, has a sideways **projecting pin 222** which is adjacent the **leading end 223** of the locking-slide and within its path of movement to prevent the locking slide from being moved. When the pin 201 passes into recess the forward shoulder 221 is driven backwardly from the recess to cause the detent arm to displace in an anticlockwise direction to cause the pin 222 to move from the path of movement of the locking-slide to enable it to be moved. The detent arm has the purpose of preventing the lock from being locked unless the catch plate and lock body are adjacent (in predetermined relative positions)

In a preferred embodiment each handle set, Fig 10, 11 and 12 comprises a **D shaped handle 63** portion engageable by the hand to urge the door open. The moveable handle 2 is operated to unlatch the door with the same hand movement and which is depressed as the hand engages the D shaped handle portion. Handle depression causes the **drive shaft 47** to rotate to cause the drive cam or hooking arm as the case may be, to rotate to disengage the catch plate.

The D shaped handle connects to a substantially vertically elongated **handle casing 64** portion which attaches to the door. The handle is substantially hollow backed with **ribs 65** running in the general direction of the D shape when viewed from behind. Between these ribs or between a rib and the side wall of the handle is a **link 66** preferably designed to look like the other ribs and spaced according to the spacing of the other ribs, which connect to the upper end of the lever. Preferably the arms appear to be integral with the underside of the handle sets and do not appear to be added parts of a mechanism and unpleasant looking and by this means arms are proved to connect the lever to the handle casing without the need to provide back cover plates on the underside of the D shaped handles. About a horizontal centre line transgressing the handle set there is an aperture through which the cylinder protrudes to be operable. The whole of the handle set is substantially (in a vertical plane parallel with the face of the door) a mirror image about this centre line and the cylinder aperture is preferably within a feature being a recess or raised portion also being a mirror image about the centre line – the purpose of the feature being to help disguise the shape of the cylinder aperture which in a preferred embodiment is pear shaped.

Within the handle casing is a **handle cam 67** which is preferably supported on a pin projecting from the wall of the handle casing. It has a substantially vertical upwardly disposed **connecting arm 68** which is at its free end  
5 (displaced from its axis of rotation) is connected to the link by a **pin joint 69** (permitting relative angular rotation as a pin joint does). The other end of the links connects by **pin joint 70** to the lever. (These pin joints preferably comprising overlapping portions of different members through which a pin is located). The lever itself is supported on a **pin 71** projecting from the  
10 underside of the D handle. The handle is outwardly biased by **spring 72** supported between the handle and lever. In an embodiment, the joint 69 may comprise a slotted aperture in the link to permit the lever to adopt an undisplaced position when the latch-slide is held by the detent in the  
15 disengageable position, alternatively the recess 48 within drive cam may be horizontally elongated and radiussed at each end while the shaft 47 may be radiussed at two opposite corners as shown in Fig11 and having proportions as shown such that the cam 46 may be moved anti-clockwise as occurs in latching without causing the shaft 47 to rotate. Referring to drawing 11 we can  
20 see that a distance across flats  $D = 2R$  will provide for uncoupling in one relative rotational direction while an additional  $+2r$  provides for the free movement necessary to accommodate the various relative locations of the block.

Within the back of each handle casing (on the underside) are upper and lower  
25 **mounting recesses 72** having a horizontal **cross hole 73**. **Mounting bars 74** Fig 6, 12 pass horizontally through upper and lower **apertures 75** in the sides of the lock casing to locate respectively within the upper recess 72 of the exterior on one side and an upper recess in the interior handle on the other side, and within the lower recess 72 of the exterior on one side and the  
30 lower recess in the interior handle on the other side. The bars comprise on each end a substantially rectangular **recess 76** having an angled (ramped) **outer wall 77**. Within the recess is a **wedge 78** having a **cross aperture 79** through which the **mounting screw passes 80** and in which it threadingly engages. The wedge has an orthogonal clearance of  $D$  to enable the wedge  
35 to be drawn towards the screw head and a longitudinal clearance to accommodate movement of the bar relative to the screw. The purpose of this construction (the wedge) is so that the handles can be tightly secured to the face of the door. Each bar is fastened within the lock body, casing by a **screw 81** which passes through an **aperture 83** in the face of the lock and through  
40 the **apertures 84** in the bosses this screw being inaccessible when the door is closed. In practise the bars could be secured to the lock so as to protrude from each side of the door and the handles mounted over the bars so that the bars located in recesses 72 and the fastening screws 80 would be inserted and threadingly engaged in their respective wedge. The screws would then be  
45 tightened and preferably progressively and in turn. (The dimensions of this portion of the invention is preferably configured such that for a door of nominal thickness say  $T$  for a width defined as  $T + t$ ,  $-t$  the wedges would be horizontally  $D/2$  from each end of the recess in which they locate) Tightening of a screw first causes the screw to advance until the **head 85** contacts the  
50 **head recess 86** and the screw leading end to located in a **recess 88** at which

time further tightening draws the wedge towards the head which causes the **ramped face 87** of the wedge to slide along the ramped face 77 while forcing the bar further in to the recess 72 to draw the handle set towards the surface of the door. Preferably the screws 80 of the exterior handle set have one-way heads preventing their withdrawel.

In preferred embodiments the lock includes locking means, Fig 5 to 9, preferably including a vertically elongated **locking slide 89** (also referred to as deadlocking slide) supported in the casing for rectilinearly movement in a vertical direction and which is moveable by cylinder 89 and/or snib operation depending on the lock configuration. In preferred embodiments a **snib** is included in the interior handle set this connecting to be coupled to a **snib cam 90** supported within the casing in apertures in the side walls. This cam is connected to the snib by a **snib shaft** and in embodiments where there is a **locking-snib** in the exterior handle set this cam is also operably connected to this cam by the same snib shaft or in an alternative embodiment an exterior **snib shaft**.

In an embodiment Fig 16, the snib shaft passes through the lock to protrude into the handle casing on either side and the snib shaft on the interior side is square in cross section and mates in a recess in the underside of the snib which is square in cross section so the two mate without free movement. The exterior end of the **snib shaft 94** is circular in cross section having a longitudinally **peripheral recess 95** defined by radially disposed **end walls 96** while the associated **recess 97** within the locking-snib is substantially circular in cross section and having clearance to relatively rotate on the snib shaft. Within the locking-snib shaft recess is at least one longitudinally elongated inwardly projecting **fin 98** which is engageable with an end wall 92. These members are configured so that when the deadlocking slide is in the undisplaced, unlocked configuration, a fin is adjacent a wall and the snib may be rotated (from a nominal undisplaced position) so that the fin drives the shaft to advance the deadlocking slide to the deadlocked position but if the snib is then turned in the opposite direction the fin moves freely within the peripheral recess and does not drive the shaft. A **stop 95** is provided to prevent the locking-snib from being rotated in an unlocking direction past the nominal undisplaced position. This stop comprising an outwardly **projecting shoulder 99** which slides with free movement in an **annular casing recess 100** in the underside of the lever set.

Preferably the snib and locking-snib, Fig 14, 15 and 16 are supported by cylindrically elongated **portions 101** which locate in **cylindrical recesses 102** in the underside of the handle casings. These recesses connect to **apertures 103** in the outer surface of the handle casings to provide operable accessibility to the ends of the locking-snib and snib. The snib extends from the exterior surface for ease of operation but the snib may also comprise an arm attached to the cylindrical portion this arm protruding from under the handle casing adjacent the face of the door. As stated above, the exterior handle set may include a hand operable **locking-snib 11**, comprising a **recessed cylinder 12** within the body of the exterior handle set which has an

accessible **slotted recess 13** in it in which the blade of a key may be inserted to operate it.

5 As stated above, preferably the internal snib, (knob or lever) and external – locking-snib, (lever, knob or key aperture), are interchangeable at fitting so that for doors which open in the opposite direction, they may be interchanged to convert the exterior handle set to the interior handle set and vice versa.

10 In an alternative embodiment Fig 14 and 15 there is a separate **exterior shaft 104** which engages without free movement in cam 90. The cylindrical portion 101 comprises an **outer part 104** including the key slot 13 and an **inner part 105** including the shoulder 99 and having a **recess 106** to accommodate the **rod head 107** the head and recess being configured to provide selective free movement between the head and recess so that when  
15 the deadlocking slide is in the undisplaced, unlocked configuration the key slot and recess 106 (the two being connected by **pins 108** locating in **recesses 109**) may be rotated to drive the shaft to advance the deadlocking slide to the deadlocked position but if the key slot is then turned in the opposite direction the shaft head remains stationary within the recess 106 while the locking-snib and key slot turn till the shoulder 99 engages a **shoulder 110** defining the  
20 recess 100. The recess 106 is preferably horizontally elongated and radiussed at each end while the head 107 is radiussed at two opposite corners as shown in Fig. This latter device provides protection against forcing because if the locking-snib is in the undisplaced position with shoulder 99 against shoulder 110 and an attempt is made to force the lock unlocked portions 104 and 105 will separate as pins 108 shear off – they being designed to do so before the shoulder 99 shears off.

25 In one embodiment the snib cam has **snib arm 111** with a **pinned protrusion 112** at its end which locates within a **horizontal slot 113** in the deadlocking slide to couple them together while in another embodiment it includes peripheral gear **teeth 114** Fig 19 which engage a rack portion of a slide 138 (in practice, a drive slide for a lower remote lock), which is operably coupled to the deadlocking slide through an interspaced pinion 136.

30 In the embodiments shown in the drawings, the cylinder is a commonly used **double cylinder 115** having a centrally located **cylinder cam 116** having an armed extension, an **arm 117** which is angularly displaceable by key operation to drive the deadlocking slide but the lock may within the scope of  
40 this invention be adapted for compatibility with other types of cylinder as described below.

45 In a preferred embodiment, the deadlocking slide 89 comprises a substantially rectilinearly moveable vertically elongated member which is supported in the second casing portion and which has a substantially horizontal **drive slot 118** which is coupled to a **deadlocking-rocker 121** and a **horizontal slot 113** in which the pinned protrusion of the **snib arm 111** locates to couple them together. (In another embodiment the snib cam and locking slide may be coupled by gear trains, the locking slide including a rack portion 119). The  
50 locking slide in either case includes a concave **cam recess 119** within its

length engageable with the pivotally supported **arm 117** comprising part of the key operable cylinder, said recess having an **upper drive shoulder 119A** and a **lower drive shoulder 119B**. Preferably towards the upper end of the casing and supported by a **pin 120** projecting from a side wall of the casing and located towards the back of the casing is an angularly displaceable **deadlocking arm 121** which has a sideways protruding **pin 122** within its length which locates within the drive slot 118 of the deadlocking slide and which has a **forward end 123** which protrudes into the path of movement of the engaging-slide.

In the embodiment having a latch-slide the said latch-slide has a **drive shoulder 124** engageable by the end 123 to drive the latch-slide downwardly to the engageable position as would occur in practise if the latch-slide had not been driven to this position by the spring 8 during latching engagement. These portions are so configured that an undisplaced deadlocking slide enables the engaging-slide to move to the fully upward position of normal movement.

In the embodiment having a hooking arm the deadlocking arm has at the forward end a sideways projecting **pin 225** which locates in a substantially horizontal **recess 226** defined by an **upper wall 227** and a **lower wall 228** in the side of the engaging-slide – the lower wall having an **angled lower portion 229** which when the engaging-slide is in the downwardly disposed, engageable position at the point contacted by the pin, has a vector defining the normal to the surface which passes through or below the axis of rotation of the deadlocking arm. The proportions are configured so that the pin cannot pass from the horizontal portion to the angled portion of the recess until the engaging-slide is in the engageable position. The pin can be moved along this angled portion while the engaging slide remains stationary and in this configuration the engaging slide is deadlocked by the deadlocking arm. In this embodiment except when deadlocked, the engaging-slide and locking-slide are always coupled and the engaging-member is moved to engage the studs by operation of the cylinder, snib or locking-snib as the case may be. Preferably the pin 122 and pin 225 are radially displaced along the deadlocking arm as shown, the pin 122 being closer to the axis of rotation 120, so that the locking-slide drives the engaging-slide further that it itself moves (i.e. the movement is amplified by the lever effect). From Fig 21, it can be seen that movement of the locking-slide upwardly causes the deadlocking arm to move the pin 225 upwardly to displace the engaging slide upwardly and during unlocking in practise the locking slide would be moved till in the undisplaced position.

As described above the invention provides an undisplaced configuration where the locking slide and engaging slide are substantially “fully upwardly disposed” as shown in Fig 7 and a first locked configuration, Fig 8 where the locking means may be displaced between these configurations by the snib and by the cylinder - the cylinder cam snib cam and the locking slide being coupled whereby translational movement of the locking slide causes the cylinder cam and snib cam to angularly displace while angular displacement of either cam causes the deadlocking slide and other cam to displace – the

two cams being operably coupled by the operably interspaced locking-slide.

At the limit of this first range of movement, the lock is locked in a **second locked configuration** and as shown in Fig 8, (and corresponding to a deadlocked engaging-slide). From this configuration the cylinder cam may be further displaced in a locking direction while the locking-slide remains substantially unmoved and where coupling between the cylinder and snib cams and locking slide does not occur so that the deadlocking slide can no longer displace the cylinder cam which secures the deadlocking slide to be unmoveable by the snib – this configuration corresponding to the **first locked configuration** of the lock. When the deadlocking slide has been moved to the deadlocking position and the cylinder cam moved to the first locking configuration an **inclined surface 126** of the exit shoulder, lies substantially orthogonal to the **pivotal axis 127** of the cylinder cam. At this point the **leading edge 128** of cam can be moved to slide on the inclined surface 126 without substantially moving the deadlocking slide.

In a preferred embodiment, the lower or exit shoulder of the deadlocking shoulder may comprise a **slide 129** supported by the deadlocking slide for limited vertical movement and biased upwardly by **spring 130** so that for the cylinder cam to be moved to the position corresponding to the first locked configuration this slide must be displaced against spring bias while the deadlocking slide remains undisplaced. This slide 129 preferably comprises a forked member having **return shoulders 131** which locate under a **shoulder 132** of the locking slide and an internal **recess 133** within which compression spring 130 locates to urge the fork away from the shoulder 132.

In the locked configurations an **inclined end portion 134** of the deadlocking arm engages an **inclined shoulder 125** of the latch slide each being inclined at an angle such that in a locked configuration, a normal through the point of contact of the members would pass through or below the pivot point 120 – the significance of this is that a load applied to the latch slide would respectively not urge at all or urge the dealocking arm further in a locking direction.

Preferably the locking slide is maintained in and urged towards the undisplaced, unlocked, fully upwardly disposed position (corresponding to a disengageable, undisplaced position of the engaging-slide) by a **ball 160** supported within a guide within the casing for horizontal movement and restrained from vertical movement and biased towards the locking slide by **spring 161** and located in a **lower recess 163** in the locking slide and preferably the locking slide is maintained in and urged towards the locked, deadlocked, fully downwardly disposed position (corresponding to an engageable, engaged fully displaced, position of the engaging-slide) by a **ball 160** biased towards the locking slide by **spring 161** and located in a **upper recess 162** in the locking slide

In yet another embodiment, operation is provided for upper and lower remote locks. The lock includes a **geared pinion 136** supported by the casing preferably on a **pinned protrusion 135** from the side of the casing and

engaged to the **rack portion 119** on the lower end of the locking slide to operably couple the locking slide and pinion 134

5 Preferably the pinion 136 has adjacent the first peripheral geared portion a **second geared portion 137** of larger diameter (in a preferred embodiment twice the diameter), which meshes with a **rack portion 138** of a **lower drive slide 139** and meshes with a **rack portion 140** of an **upper drive slide 141** which projects from the upper end of the casing to connect to rod connected to a remote lock. By this means movement of the locking slide  
10 imparts increased movement to the upper and lower drive slides (in the preferred embodiment referred to 2:1 ratio). The protruding ends of the drive slides include **apertures 142** by which the rods may be secured.

15 The snib cam in this embodiment may have geared peripheral portion which meshes with the lower drive slide.

20 In an embodiment, the lower remote lock comprise one or more apertures in a **slide plate 147** which comprise an **elongated oval aperture 143** connected to a **lower elongated narrower aperture 144** defined by **side shoulders 145** similar to those of the engaging-slide the aperture 143 being defined by **side walls 146**. The vertically moveable **slide plate 147** is supported at each end by a **rivet 148** or other fastener which is connected to a **mounting plate 149** plate which is fastened to the door by **screws 150** or other fasteners. Within the slide plate are vertically elongated **apertures 151** to permit movement of the slide plate relative to the rivets. The upper end of the slide plate has an extension containing a **slotted aperture 152** by which it may be connected the **lower rod 153** connectable to 139. The walls 146 are included to ensure that the stud heads may be withdrawn from the aperture without getting caught.  
25  
30

As with the lock described above and of similar construction. There is also a **remote catch plate 154** supporting one or more headed **remote studs 155**. There are apertures in the face of the door to permit passage of the studs.

35 When the door is closed, the lock may be operated by snib or cylinder to drive the lower drive slide downwardly to drive the lower rod to drive the slide plate of the lower remote lock to cause the side shoulders 145 to position in front of the heads of the remote studs. The lock may also be operated to disengage the remote studs. The portions are proportioned similarly to those described  
40 above so that in a locked lock the heads of the remote studs can neither be substantially rotated nor moved from behind the shoulders 145. Preferably the plate 147 and latch slide, from a disengaged, undisplaced position to an engaged position displace the same distance.

45 Preferably there is also an upper remote lock which is connected to the upper drive slide and which operates in a similar manner.

50 Preferably the lock is operated by both the double cylinder and an interior snib, (being a hand operable member) but the invention also anticipates a lock configured as follows and operable as described below:

- A double cylinder only, key operable from both sides each locking and unlocking from the first configuration
- A cylinder being key operable exteriorly and knob operable interiorly, each locking and unlocking from the first configuration
- 5 • A cylinder key operable on the exterior and being a dummy cylinder interiorly and a hand operable snib interiorly, the cylinder locking and unlocking from the first configuration and unlocking from the second configuration with the snib locking and unlocking from the second configuration
- 10 • A snib interiorly only, locking and unlocking from the second configuration
- A single operable cylinder exteriorly locking and unlocking from the first configuration
- A single cylinder interiorly locking and unlocking from the first configuration
- 15 • Locks configurations as described above but in which there is a locking-snib exteriorly which can lock the lock to the second configuration
- and other such configurations

20 Preferably the cylinder, for ease of operation of the key is located as far towards the rear of the casing as is practicable and preferably the rear casing wall is omitted behind the cylinder.

25 The above described configurations would have handle sets to suit, i.e. the inclusion or omission of knobs and or levers and the omission or plugging of associated mounting recesses and the provision of double cylinders having a key operable barrel on each end or cylinders having a key operable barrel on one end and a solid dummy end on the other or a operable knob as the case may be. The inclusion of a snib does not necessitate the inclusion of a cylinder and the inclusion of a cylinder does not necessitate the inclusion of a snib lever or knob but where a locking-snib is employed exteriorly it is preferable that there be a snib interiorly.

30 Although the description has been limited to sliding doors, many aspects of the invention are adaptable to hinged doors. For example if the channel had side apertures and the engaging-slide also side apertures the stud heads can be brought within the rails of the engaging-slide to subsequently be engaged by the forks, and the lock would suit a hinged door or window. The face of the auxiliary in this embodiment would be angled so that striking by the end of the stud head would cause inwards depression of the auxiliary bolt followed by movement as described above.

40 In yet another embodiment shown in Fig 24 the lock is essentially the same as that shown in Fig 21 except that the lower fork is omitted and replaced by a triggered sliding latch bolt and the pivotal latching hook is also omitted. The means to restrict operation of the key, (and consequential movement of the

45 fork) to lock the lock unless the lock has engaged the catch plate, is relocated adjacent the upper, (only fork) and comprises a push-in button to replace the pivotal arm 219 of the earlier embodiment – as previously explained, this means prevents the lock from being (key) locked and the door closed to damage the lock. Importantly the sliding latch bolt is supported in the block

50 210 which is adjustable within the range  $\pm 4\text{mm}$  as previously described.

In more detail the embodiment includes a **latch bolt 301**, a displaceable **auxiliary bolt 302** positioned adjacent the latch bolt and an **operating cam 303** which connects to external levers and by which the latch bolt is made to retract

Operation of the external lever in an unlatching clockwise direction, ( to disengage the latch bolt from the catch plate), causes the cam to rotate (from a nominal undisplaced position) in a clockwise direction Figs 24 to 27, and a **shoulder 305** located at the end of an **armed extension 304** of the cam 303 to engage the **shoulder 306** of an **pivotal member 307** to cause it to rotate in an anti-clockwise direction. This pivotal member 307 forward of the latch bolt is supported by a **pivotal pin joint 308** (to connect to block 314) having a horizontal axis of rotation and between joint 308 and shoulder 306 is a **drive elbow 309** which during unlatching engages with a inwardly protruding **drive shoulder 310** of the latch bolt to drive it downwardly to cause the latch bolt to move downwardly to a retracted, disengaged position. Preferably this drive shoulder comprises a sideways protruding pinned member. The latch bolt in use would retract to a position where it has disengaged a slotted **stud 311** at which point the door in which the lock is fitted can be opened. In normal operation, the lever would then be released to cause the cam 303 to angularly displace towards the undisplaced position. The arm 307, biased by tension spring 313 towards the shoulder 306 would follow the cam and move to an undisplaced position. Simultaneously, the latch bolt would move upwardly under biasing means (spring 312) towards a partially extended position where it protrudes into a substantially cylindrical **aperture 315** in the **block 314**. The latch bolt moves upwardly until it is engaged by the auxiliary bolt, (at which point it extends partially into the aperture as shown in Fig 24), while the cam continues to displace until it reaches its undisplaced position.

In normal usage, when the door is closed the latch bolt and the auxiliary bolt are downwardly moved as they in turn slide up the ramped **leading edge 316** of the latchable stud 311. (Preferably both the latch bolt and auxiliary bolt also have ramped leading end portions, 317 and 318 respectively to assist latching engagement) When the latch bolt attains the position over the **stud recess 319** in the stud it moves (under biasing action 312) to the fully extended position shown in Fig 26 so as to effect longitudinal engagement between the stud 311 and lock body. (Because the stud locates within a substantially cylindrical aperture lateral engagement is also effected)

The latch bolt is able to move upwardly to the fully extended position because depression (being downward displacement) of the auxiliary bolt by causes it to disengage the latch bolt as described below.

In more detail the latch bolt mechanism comprises a rectangular boxlike block 314 as previously described having the cylindrical aperture 315 which joins a slotted **aperture 320** through which the latch bolt and auxiliary bolt have passage. The latch bolt preferably has side wings 321 supported on either side by portions of the block which is preferably of nylon.

The auxiliary bolt has side shoulders 322 which locate within vertically elongated **apertures 323** in the block each being configured such that the auxiliary bolt can move between a position Fig 27 (nominally the undisplaced position) where its leading end 318 extends into the aperture 315 and a position Fig 25 where it is held by the stud so as not to protrude into the aperture. When the auxiliary bolt is depressed by the stud it slides downwardly but in doing so a **tail end 324** slides up a **ramped portion 325** of the block so as to move this portion of the auxiliary bolt away from the latch bolt, against biasing action of **spring 326** which locates within a pocket in the auxiliary bolt to push on a portion of the block – (this spring by dent of the ramped faces 324 and 325 also urging the auxiliary bolt upwardly) In so moving a **detent shoulder 327** of the auxiliary bolt is moved out of the loci of movement of a rearwardly disposed **shoulder 328** of the latch bolt. Thus when the auxiliary bolt is depressed it does not refrain the latch bolt from moving to the fully extended, protruding position. Unless depressed by the stud the auxiliary bolt is undisplaced (biased towards the unrotated, extended position by spring 326) and the shoulder 327 lies in the patch of shoulder 328.

During unlatching the latch bolt is retracted, Fig 25, while the auxiliary bolt is held retracted by the stud. As the stud leaves the aperture the auxiliary bolt slides upwardly to the undisplaced position to locate shoulder 327 above the shoulder 328 of the latch bolt. When the latch bolt subsequently moves upwards after being disengaged by the stud and released by the arm 309 the shoulder 328 engages shoulder 327 to restrain the latch bolt in the partly extended position.

Block 314 has a through aperture 329 in which a compression spring 330 locates to be held compressed by the internal walls of channel. The spring is sufficiently strong that during normal operation of the lock the block is restrained fixed relative to the channel, but if the door moves relative to the opening (vertically  $\pm 4\text{mm}$ ) then the stud through the ramped end portion 316 can overcome the frictional force associated with spring 330 to move the block so that aperture 315 and stud 311 remain axially aligned to facilitate normal operation of the lock. It should be noted that shoulders 305 and 306 are configured to accommodate movement of the block  $\pm 4\text{mm}$  i.e. there is sufficient overhang that they always correctly engage.

In this last embodiment, the engaging slide 7 has a rear **circular aperture 331** in which a disclike **head 332** of a **pin 333** locates urged towards this engagement by **spring 334**. The portions are configured such that when the engaging slide 7 and the locking slide 89 are undisplaced (i.e. the lock is unlocked and the fork 38 is not within the relative loci of movement of the stud 5) then the head 332 locates with the aperture 331 to prevent movement of either said slides 7 and 89. Relative displacement of the stud 5 to within the lock body causes the stud to rearwardly displace the head 332 into a vertically elongated slot, Fig 25 in the rear of the slide 7 to disengage the pin 333 from the engaging slide 7 to enable it and the locking slide 89 to be operated.

In this last embodiment, the stud 5 and 311 when fitted are fixed longitudinally lengthwise and rotationally in relation to the **catch plate 336** and adjustment is provided by packers which fit between the plate 336 and the **door jamb element 337**. Behind the element 337 the slotted stud 331 has the threaded **shank 337** which threadedly engages in a **threaded hole 338** in a **backing plate 339**. Between the plate 339 and 337 is a compression **spring 340** which facilitates angular alignment of the stud 311 while holding it fixed and which during attempted forced entry enable this stud 311 to move towards the lock body to ensure that the stud 5 takes-up more of the load than it otherwise might. This mechanism providing protection for the latch bolt which is less able to resist high longitudinal loadings than the fork 9.

Stud 5 is similarly attached to the plates 336 and 339 but solid washer 341 replaces the spring or spring washer 340.

Throughout this specification and claims which follow, unless the context requires otherwise, the word "comprise" and variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers or steps but not the exclusion of any other integer or group of integers and the positional prepositions such as up, down, rear, clockwise anticlockwise which are used to assist in description of the preferred embodiments have in general no absolute significance.

**Page(s) 24 - 27 are claims pages**

## THE INVENTION ARE AS FOLLOWS:

- 1 A lock lockable exteriorly by a first hand operable member but not unlockable by the said first hand opeable member
- 2 A lock including a casing, one or more moveble forks and headed studs attached in useage to an element defining part of a door opening, said forks being moveable to locate behinds the heads of the studs to retain the heads within the casing.
- 3 A lock for a wing comprising a casing of a first box-like portion connected to an elongated channel
- 4 A lock for a moveable wing, including a cylinder and a casing wherein the rear wall of the cylinder is omitted to place the cylinder as far from the front edge of the casing as is possible
- 5 A lock including handle sets mountable on both sides of a door and including means of urging the handle sets towards the door to tighten them including a recess with an angled wall and a wedge shaped member.
- 6 A lock for a moveable wing, including handle sets each including a hand operable member and a recess for a double cylinder, the handle operable members being interchangeable to effect a different locking functionality
- 7 A lock wherein the handle sets comprise a D shaped handle with a lever operable in the opening direction of of the door.
- 8 A lock including a casing, a key operable cylinder having a rotateable armed cam and a locking slide wherein the locking slide is moveable by key operation to effect a locking function, said arm of the cylinder cam locating between shoulders of the locking slide which thereby define therebetween a cam recess, one of the said shoulders comprising part of a slide member supported by the locking slide and maintained within a range of limited movement by a spring
- 9 A multipoint lock including, a key operable cylinder and/or hand operable member, at least one moveable fork, at least one engageable stud and at least one remote lock wherein when the fork and stud are adjacent in a predisposed position, the cylinder and/or hand operable may be operated to actuate the remote lock.
- 10 A remote lock for a door comprising means to mount the lock in relation to studs mounted to an element defining part of a door opening and a moveable plate having an aperture permitting the passage of the heads of the studs connected to an aperture of reduced width defined by side shoulders between which the heads cannot pass.
- 11 A lock including a rectlinearly moveable catch plate and a stud, the said plate and stud automatically engaging under the action of a spring when

when each in relation to the other is within a pre-determined range of positions

5 12 A lock where the lock body and catch plate are engageable within a range of positions defined by an alignment pin

13 A lock wherein the engaging means comprises a hooked member and slide mean

10 14 A lock wherein the locking means includes at least one slide of slide means and the engaging means comprises a hooked member wherein in the first and second locked configuration the hooked member is restrained from movement by the slide of the slide means

15 15 A lock including locking means and engaging means and means to restrict operation of the locking means until the engaging means is operative

16 A lock including a key operable cylinder, said lock being unlockable by operation of the cylinder

20 17 A lock unlockable interiourly by a second hand operable member

18 A lock lockable and unlockable exteriorly and interiorly by operation of a double cylinder

25 19 A lock wherein the first hand operable member comprises a rotateable member having a slotted aperture and requiring the insertion of a key or the like for operation, the said member being inaccessible for hand operation otherwise.

30 20 A lock wherein the forks automatically enagage the studs when the door is moved in a closing direction

35 21 A lock wherein the lock forks are engageable with the studs to enagage the studs to retain the door in a closed position said lock providing engagement when the studs are displaced vertically within upper and lower limits from an ideal position in relation to the casing

40 22 A lock wherein the recesses within the casing which permit the passage of studs and the recesses in the forks to enagage the heads are all elongated to accommodate engagement in multiple positions within the said limits

45 23 A lock wherein the forks comprise metal parts supported in a latch-slide which is moveable by spring biassing means so that the forks enagage the studs

24 A lock wherein the latch-slide is a resilient member

50 25 A lock including detent means wherein the latch-slide and carried forks are rstrained in a disengageable and disengaged position until the lock casing

is in a pre-determined position relative to the element defining part of the door opening at which time the detent is rendered inoperative.

- 5 26 A lock including a drive cam supported in the casing said cam having an arm moveable upwardly to displace the latch-slide against biasing means to the disengaged position, said detent in operation restricting movement of the drive cam to restrain the latch-slide from moving to the engageable or engaged position.
- 10 27 A lock including a toothed rocker member operably coupled to the drive cam and a toothed outwardly biased auxiliary bolt such that depression of the auxiliary bolt by a stud head causes its geared portion to release the geared portion of the rocker member which otherwise would remain engaged by the auxiliary bolt to enable the latch-slide to be moved to the engaged position
- 15 28 A lock wherein the studs are outwardly adjustable by rotation but may not be significantly rotated when engaged in the lock body.
- 20 29 A lock including an alignment pin to maintain and guide the lock casing in relation to the studs
- 25 30 A lock for a door having a pear-shaped euro cylinder located in an oval recess on the face of the handle sets and substantially at the vertical centre of the handle sets.
- 30 31 A lock including a deadlocking slide operable by an interior or exterior hand operable member or by an exterior cylinder or by an interior operable cylinder whereby the latch-slide is driveable to a limit of its movement in a locking direction.
- 35 32 A lock according to wherein the apertures include a raised cupped wall to facilitate stud head removal.
- 40 33 A lock including a deadlocking slide and a geared pinion supported by the casing said pinion being operably coupled to the deadlocking slide, and drive slides having rack portions mating with the pinion one on each side and being of extended length so that one protrudes from the top of the casing while one protrudes from the bottom to operate upper and lower remote lock respectively, wherein movement of the drive slide during lock operation operates the remote locks
- 45 34 A lock wherein movement of the locking slide causes greater movement of the engaging slide and drive slides
- 50 35 A lock wherein the deadlocking slide meshes with a geared portion of the pinion of reduced diameter.
- 36 A lock including counteracting means operable by movement of the locking slide and by which remote locks may be operated

37 A lock including points of attachment for rods connected to remote locks these points of attachment moving simultaneously with the locking slide but relatively proportionally more.

5

38 A lock including co-acting means operable by movement of the locking slide and by which remote locks may be operated

10

39 A lock including points of attachment for rods connected to remote locks these points of attachment moving simultaneously with the locking slide but relatively proportionally more.

40 A lock according to any of the above claims including a triggered latch bolt

15

41 A lock including a relatively displaceable triggered latch bolt

42 A lock for a sliding door according to any of the above claims

20

43 A lock for a hinged door according to any of the above claims

44 A lock for a window according to any of the above claims

25

45 A lock having a sliding triggered latch bolt and a sliding bolt operable by a cylinder

46 A lock including a catch plate having biasing means to accommodate relative movement.

30

47 A lock having a catch plate having biasing means to effect fastening

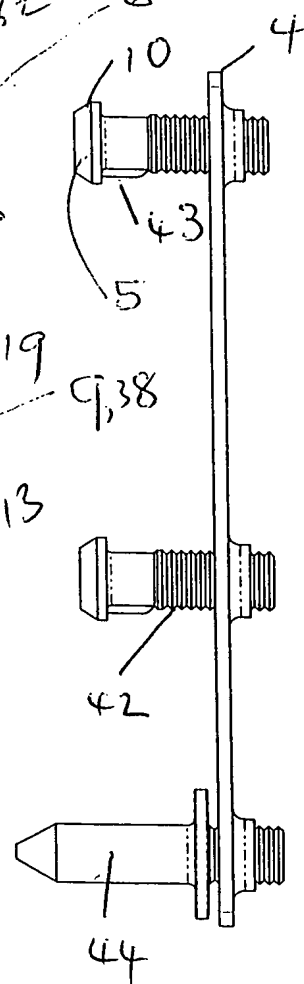
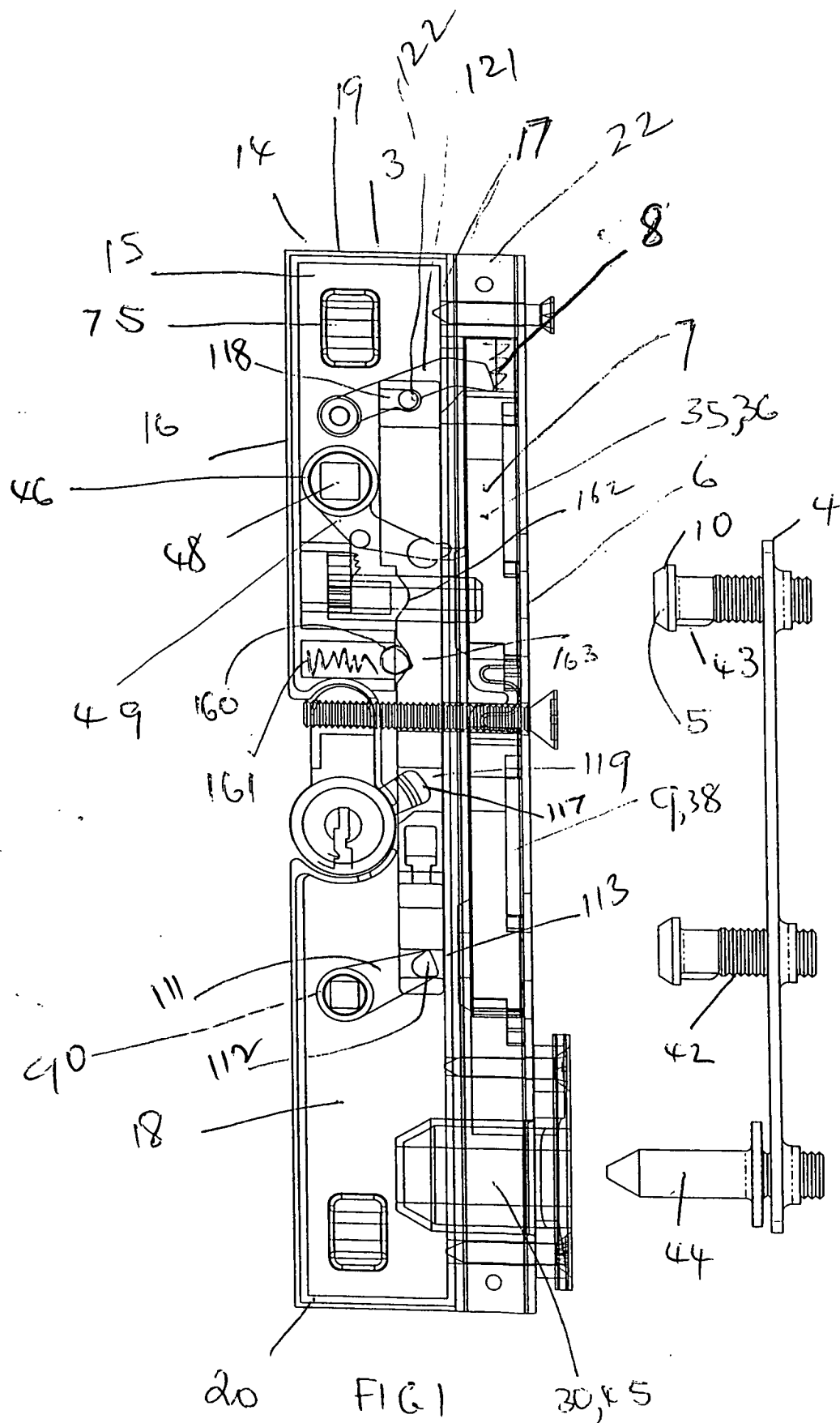
48 A lock substantially as described herein with reference to and as illustrated in the accompanying drawings.

35

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NAME OF APPLICANT: ~~J. Russell Watts~~

Date: 6/2/2000





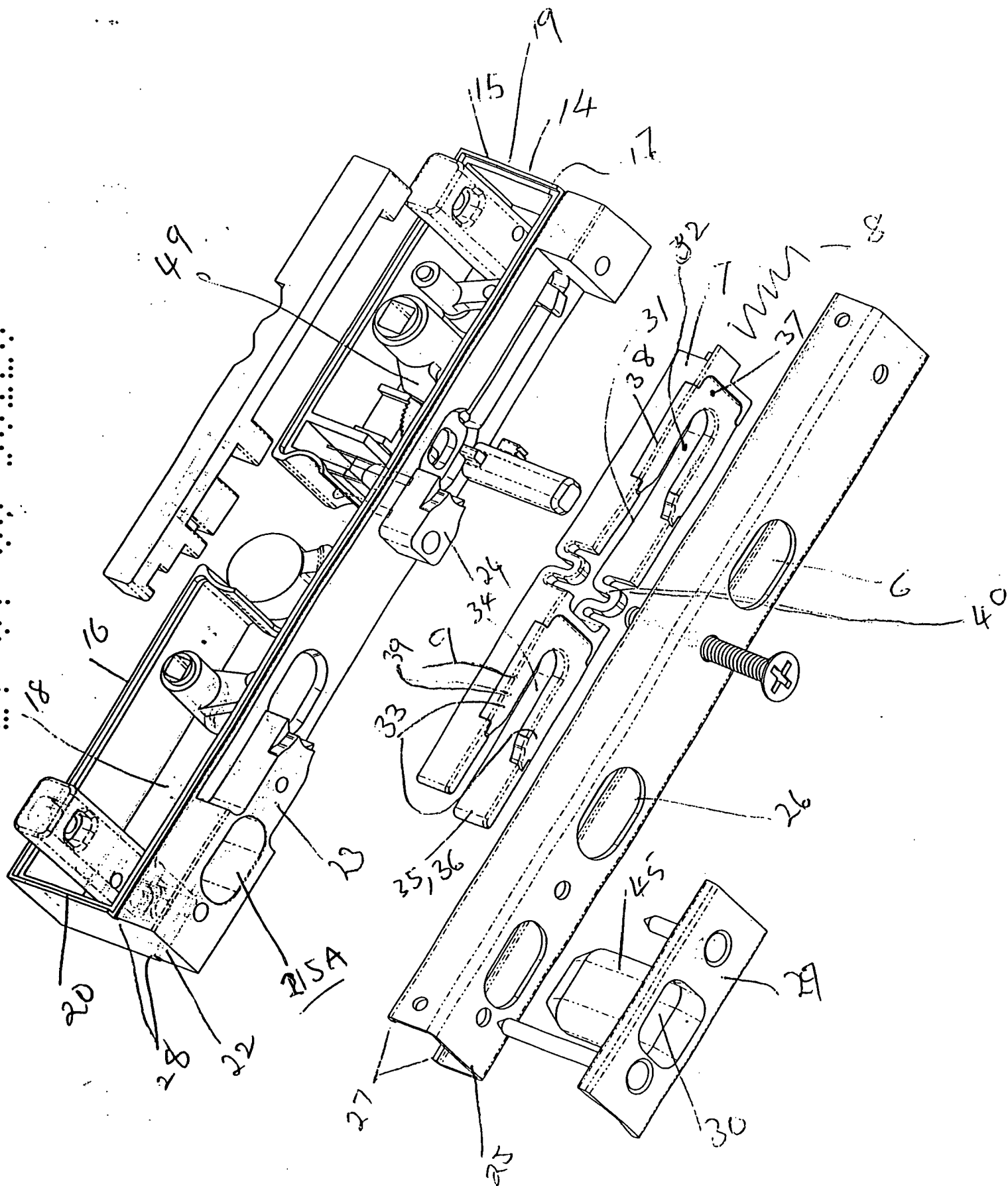


FIG 3

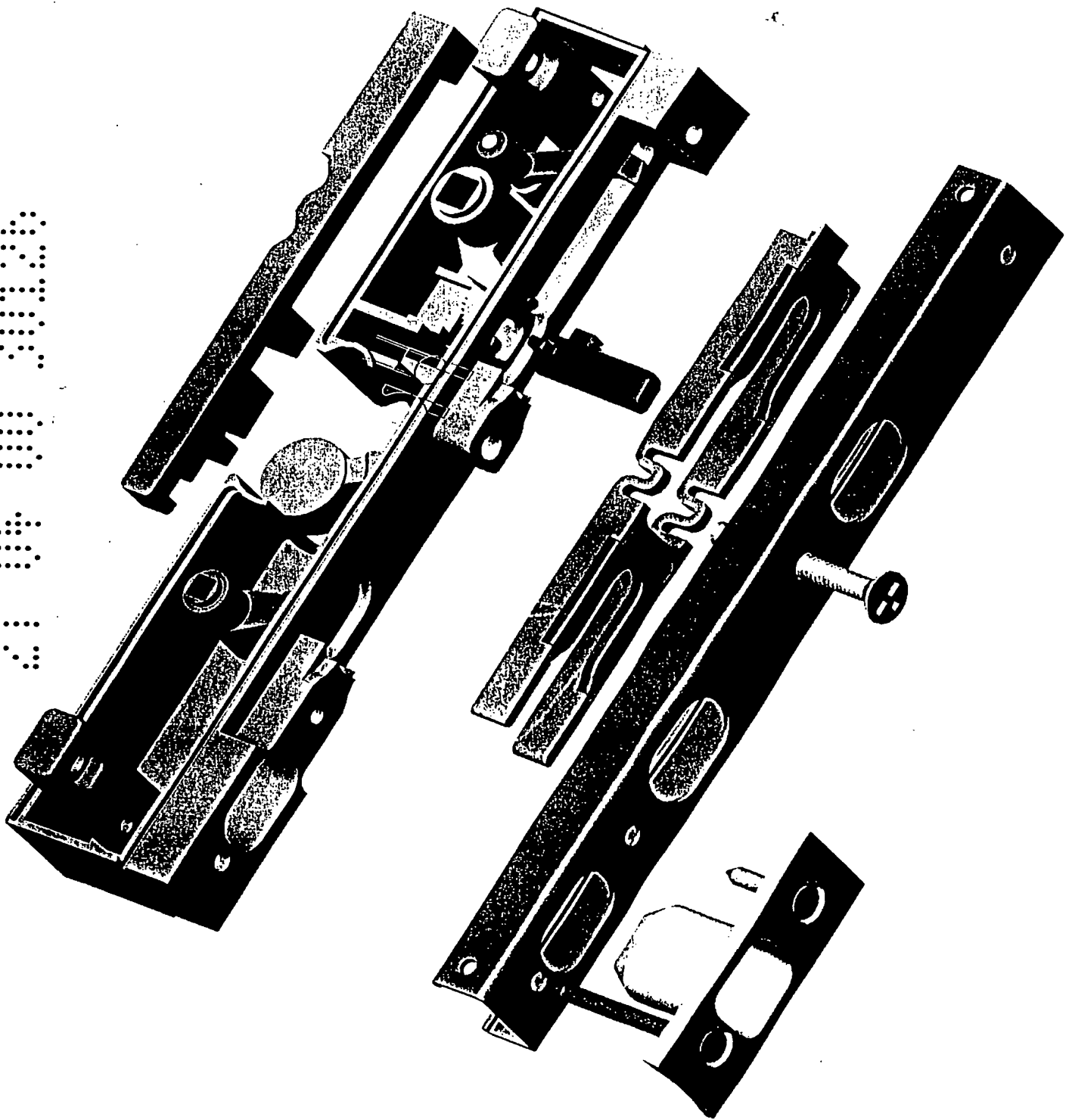


FIG 4

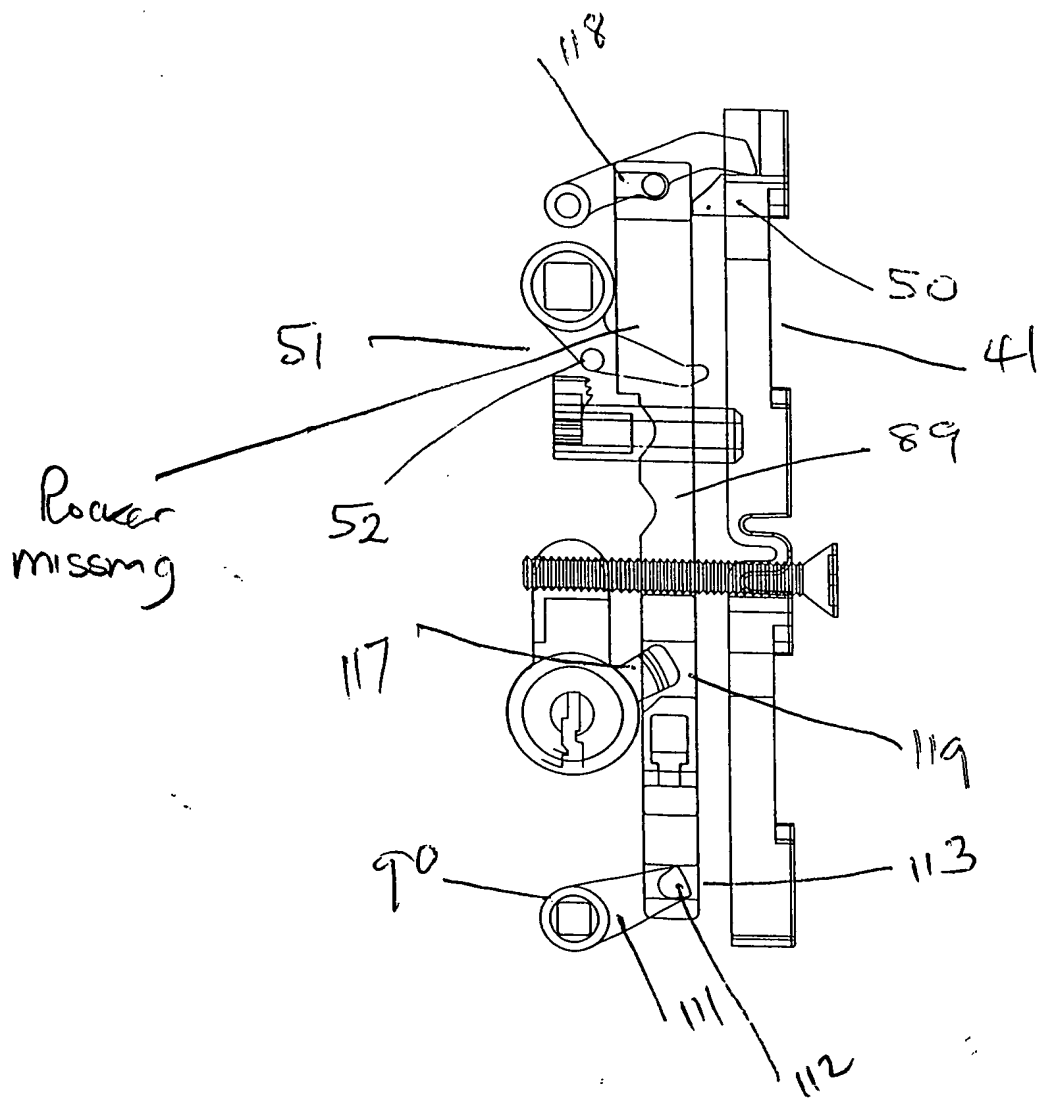


FIG 5

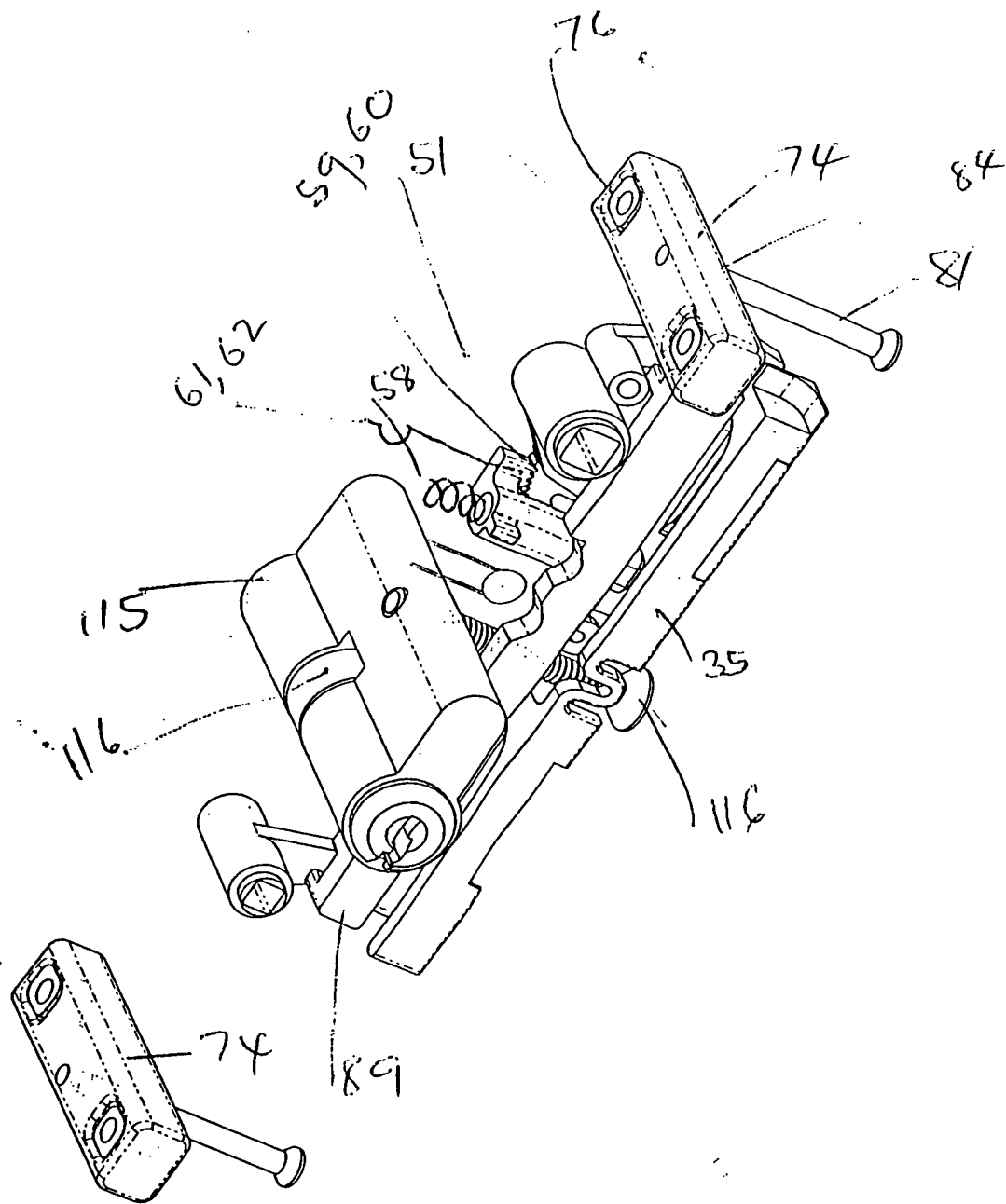


FIG 6

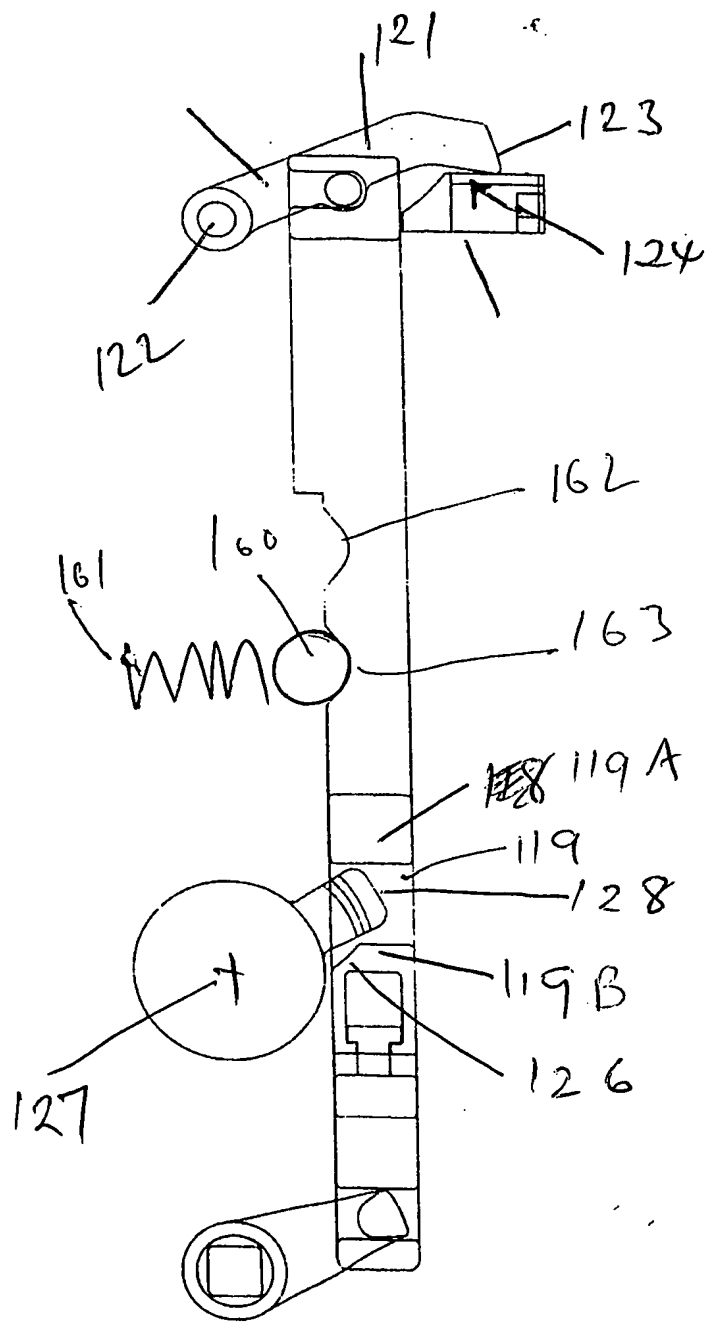


FIG 7



FIG. 9

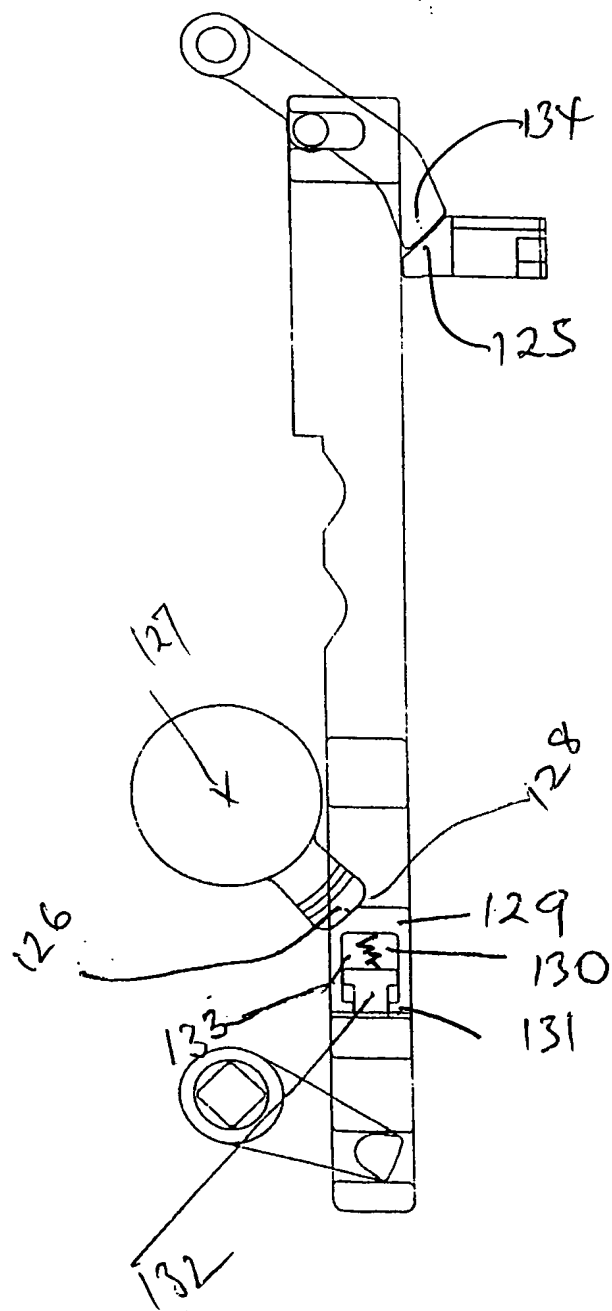
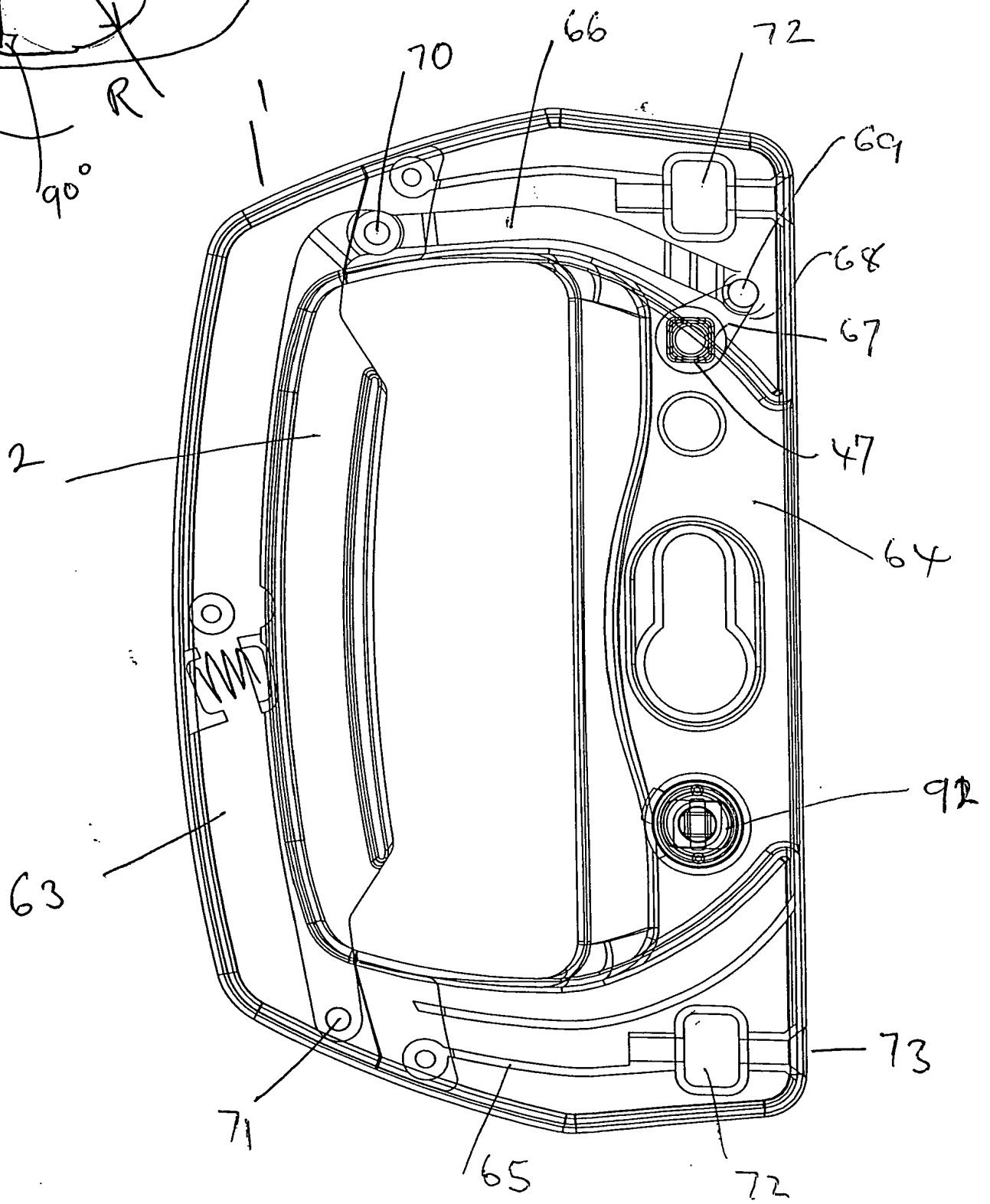
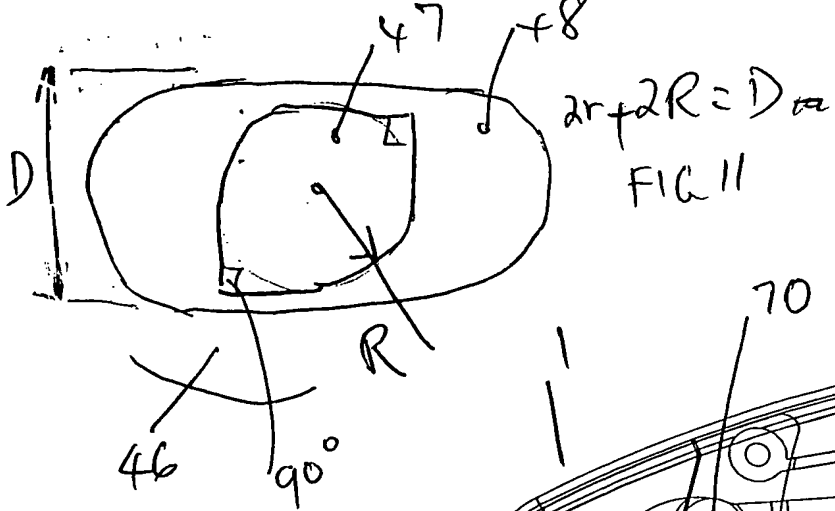


FIG 9



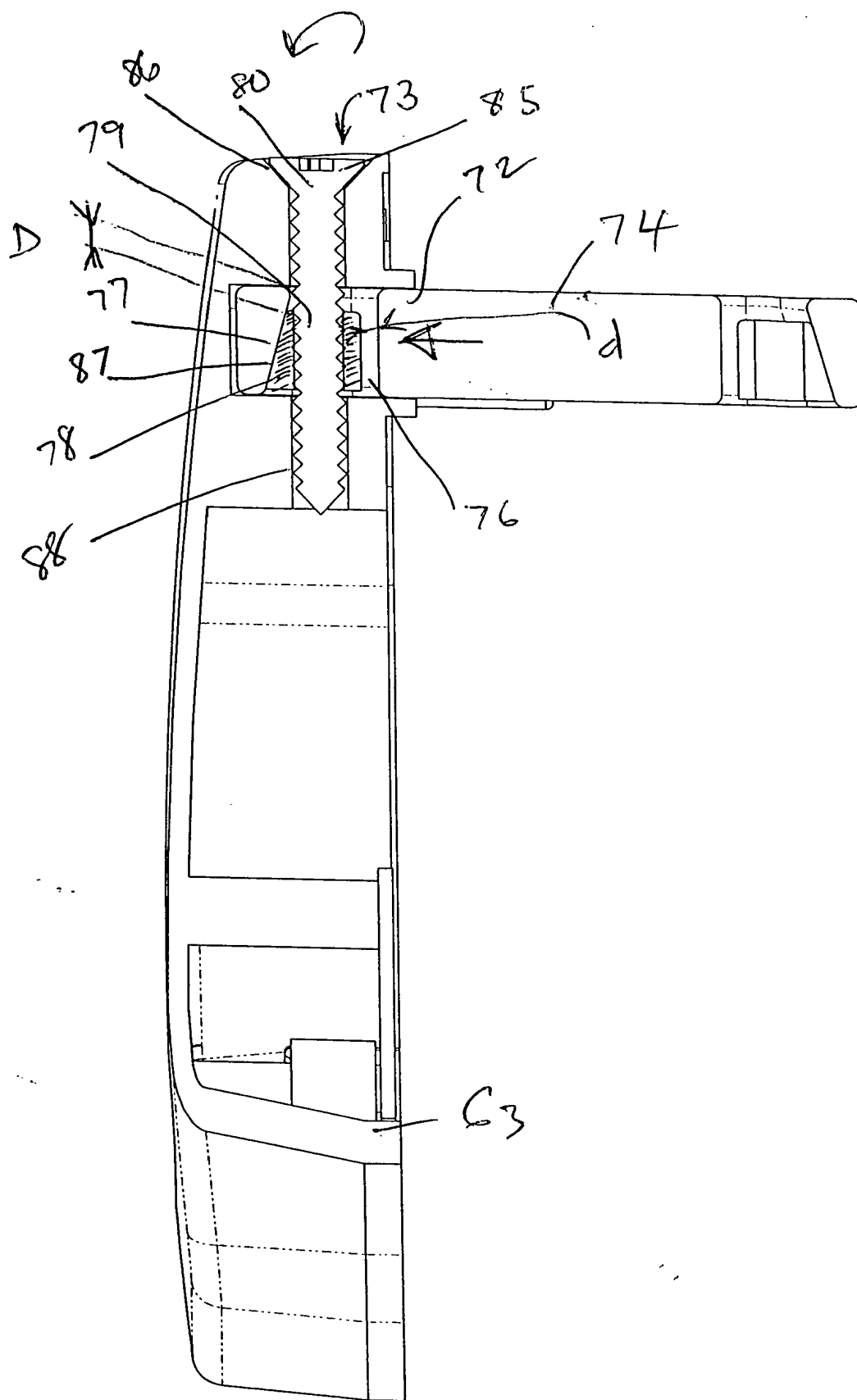
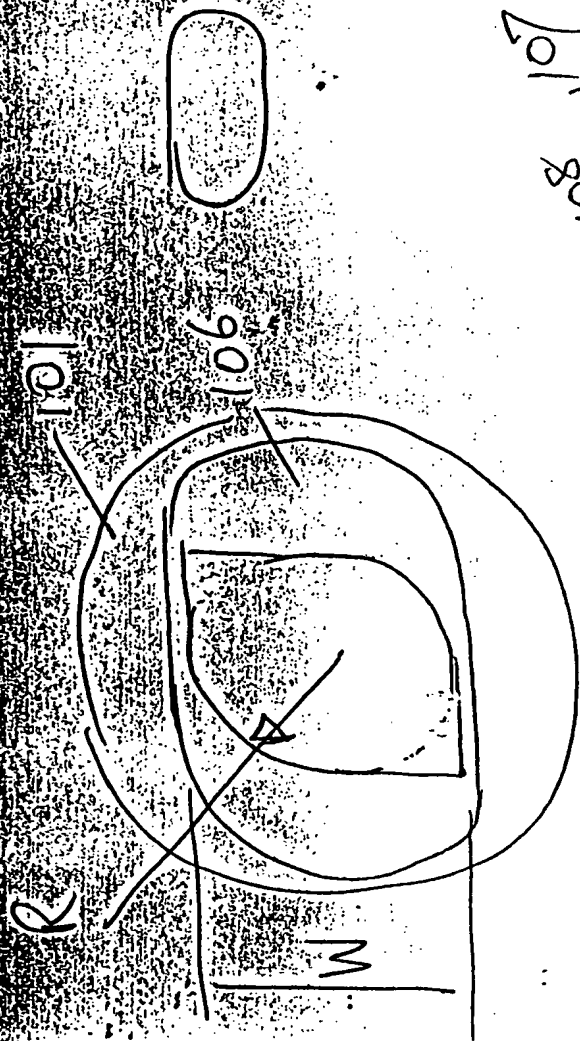


FIG 12



$$2R = W$$

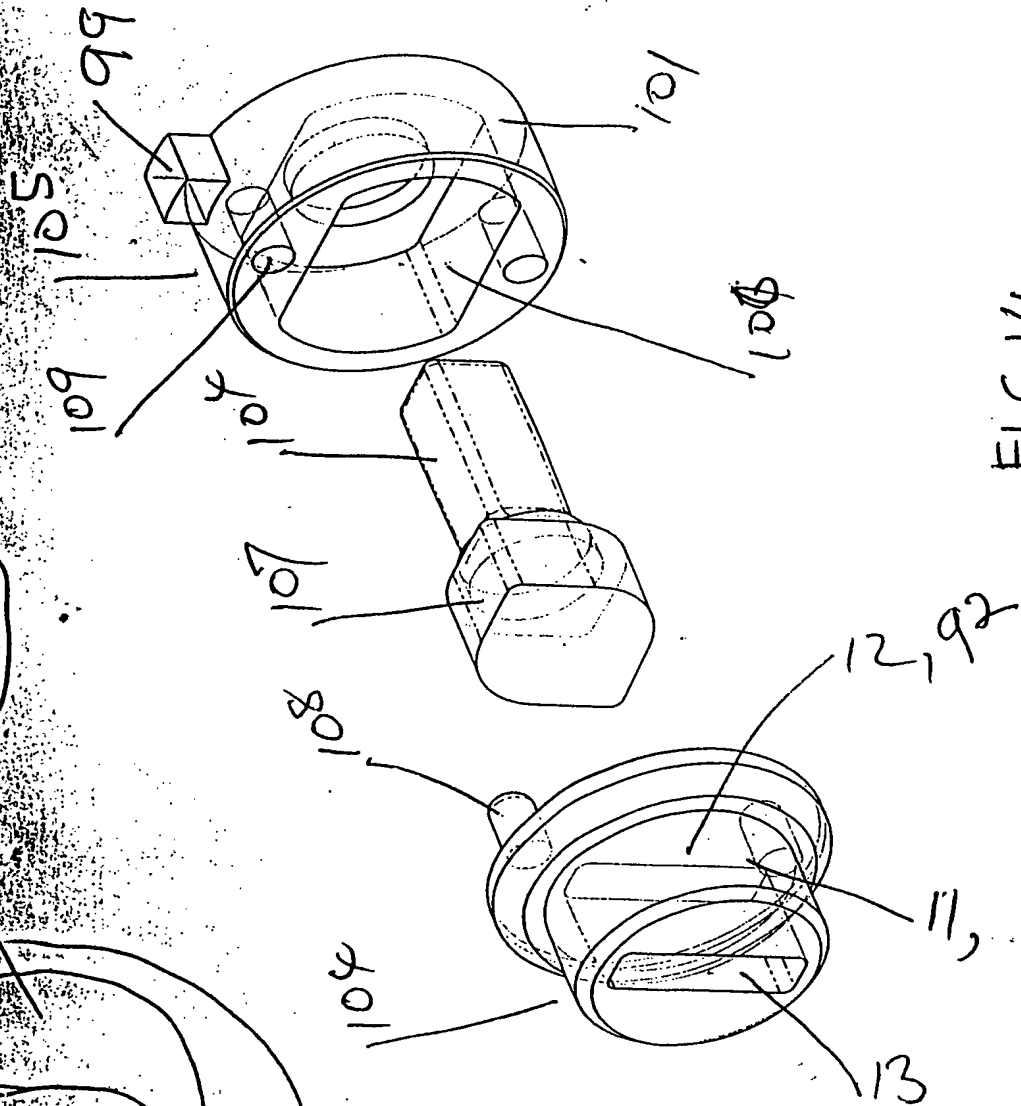
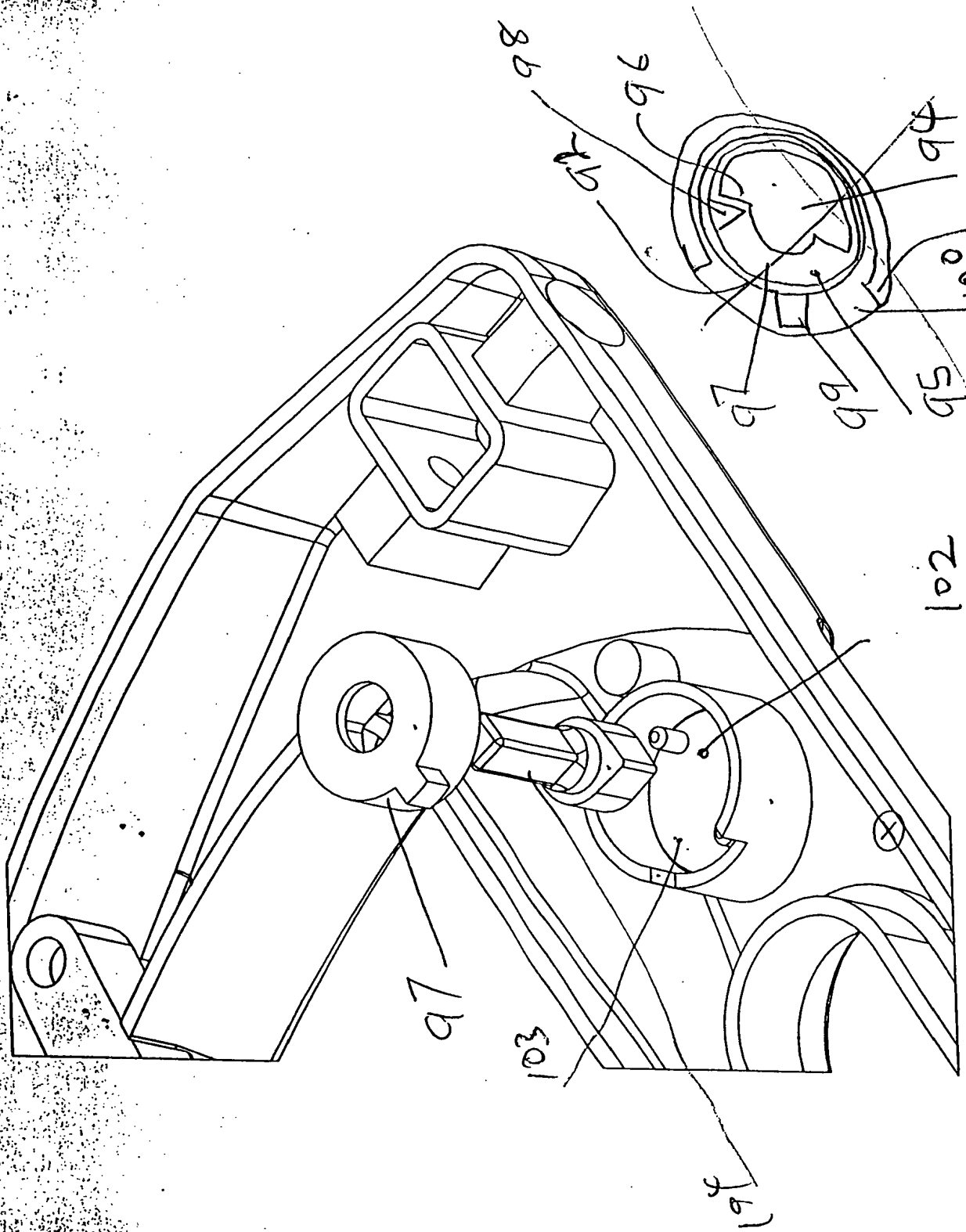


FIG 14



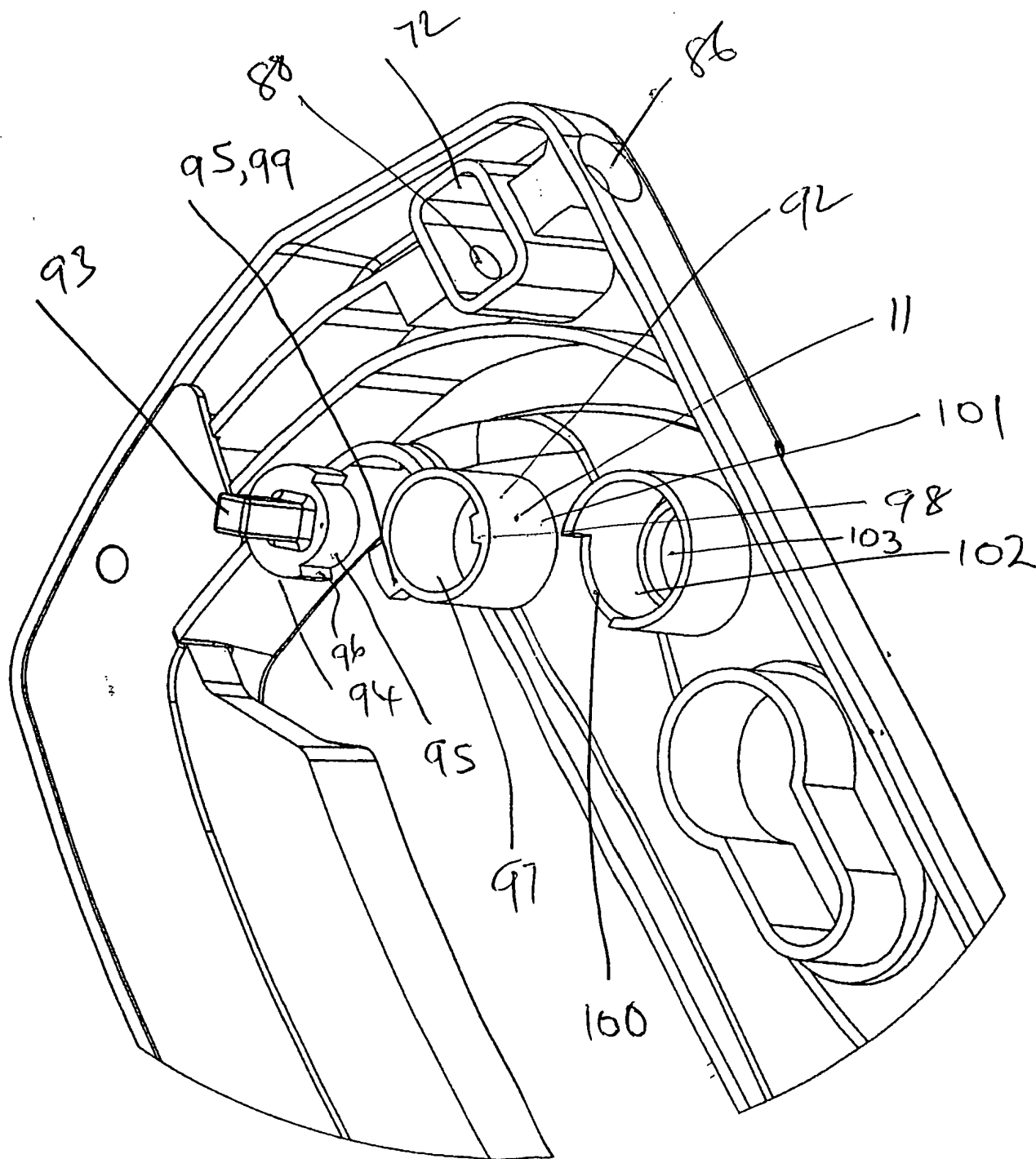


FIG 16  
FIG

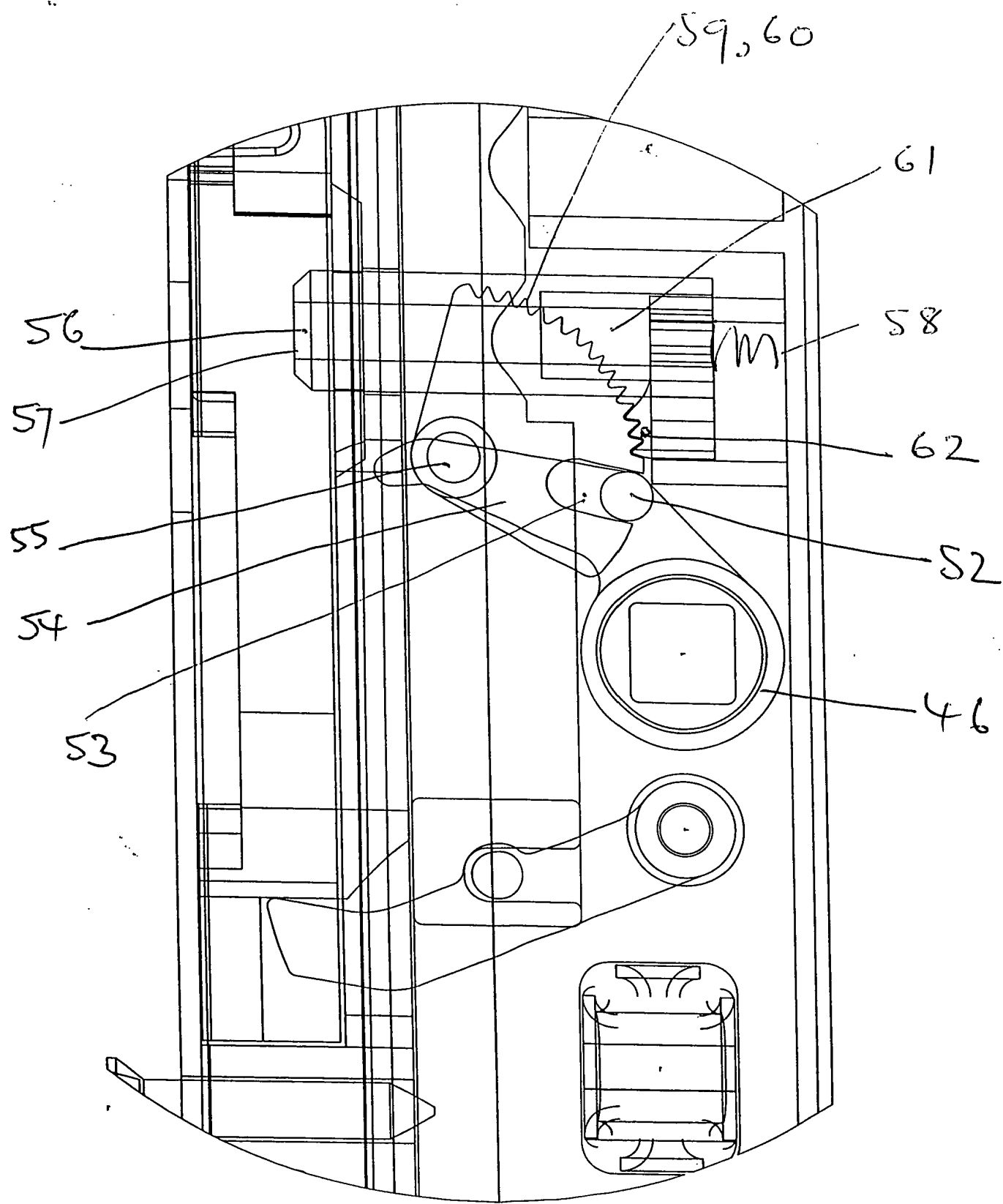


FIG 18

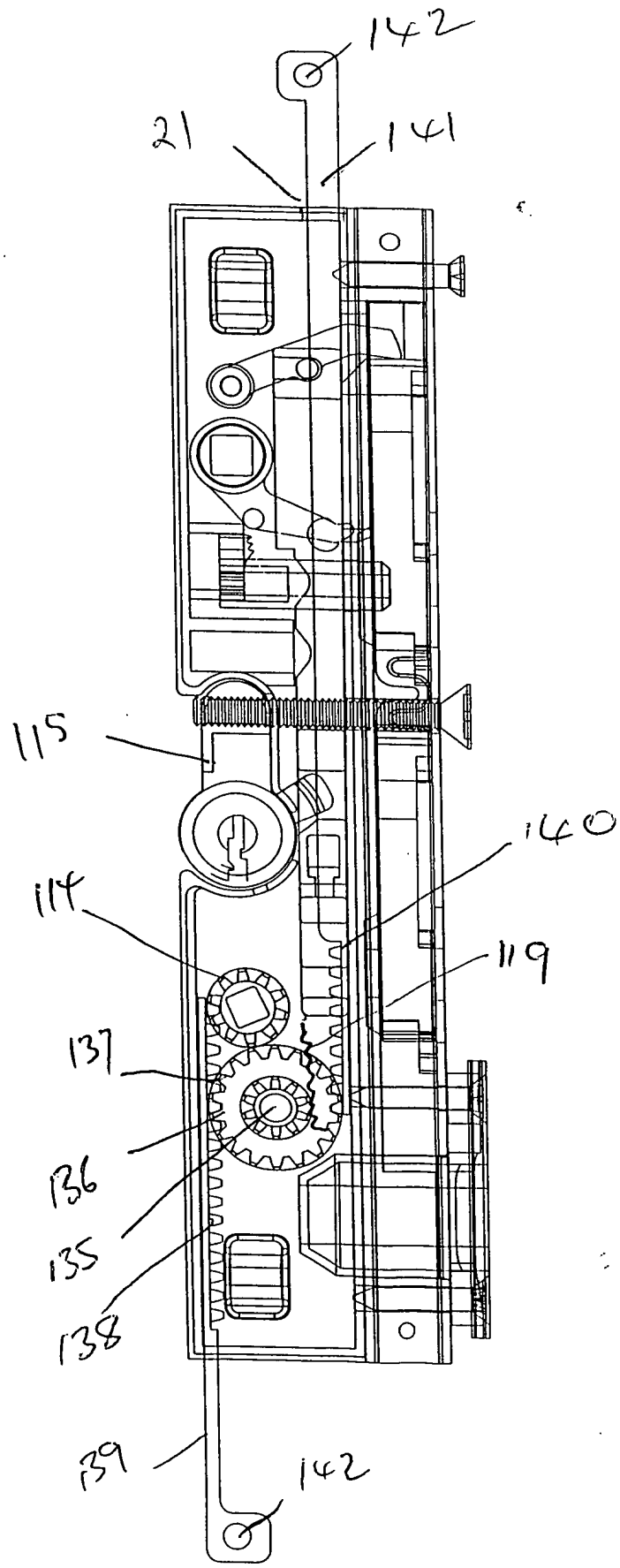
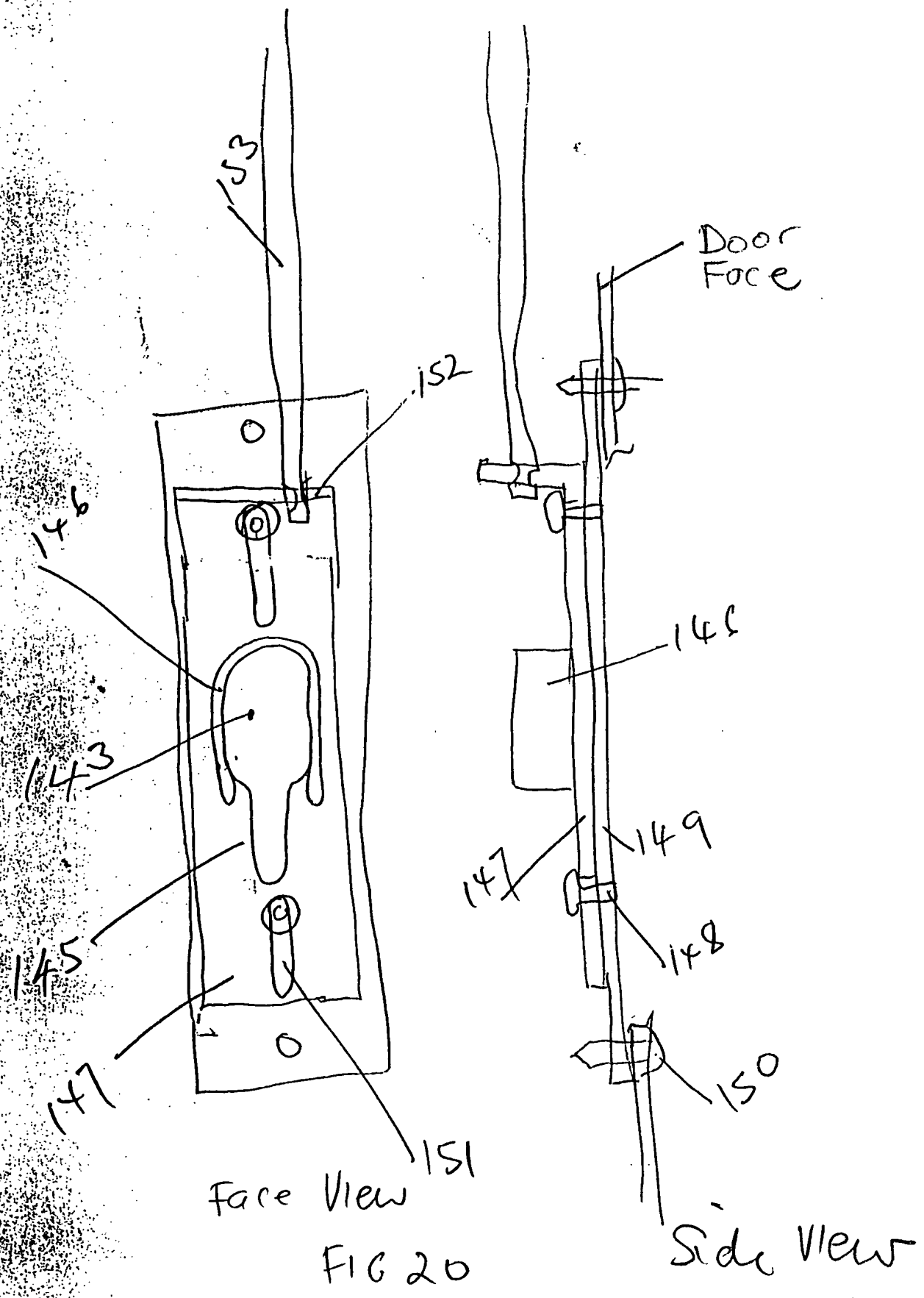


FIG 19



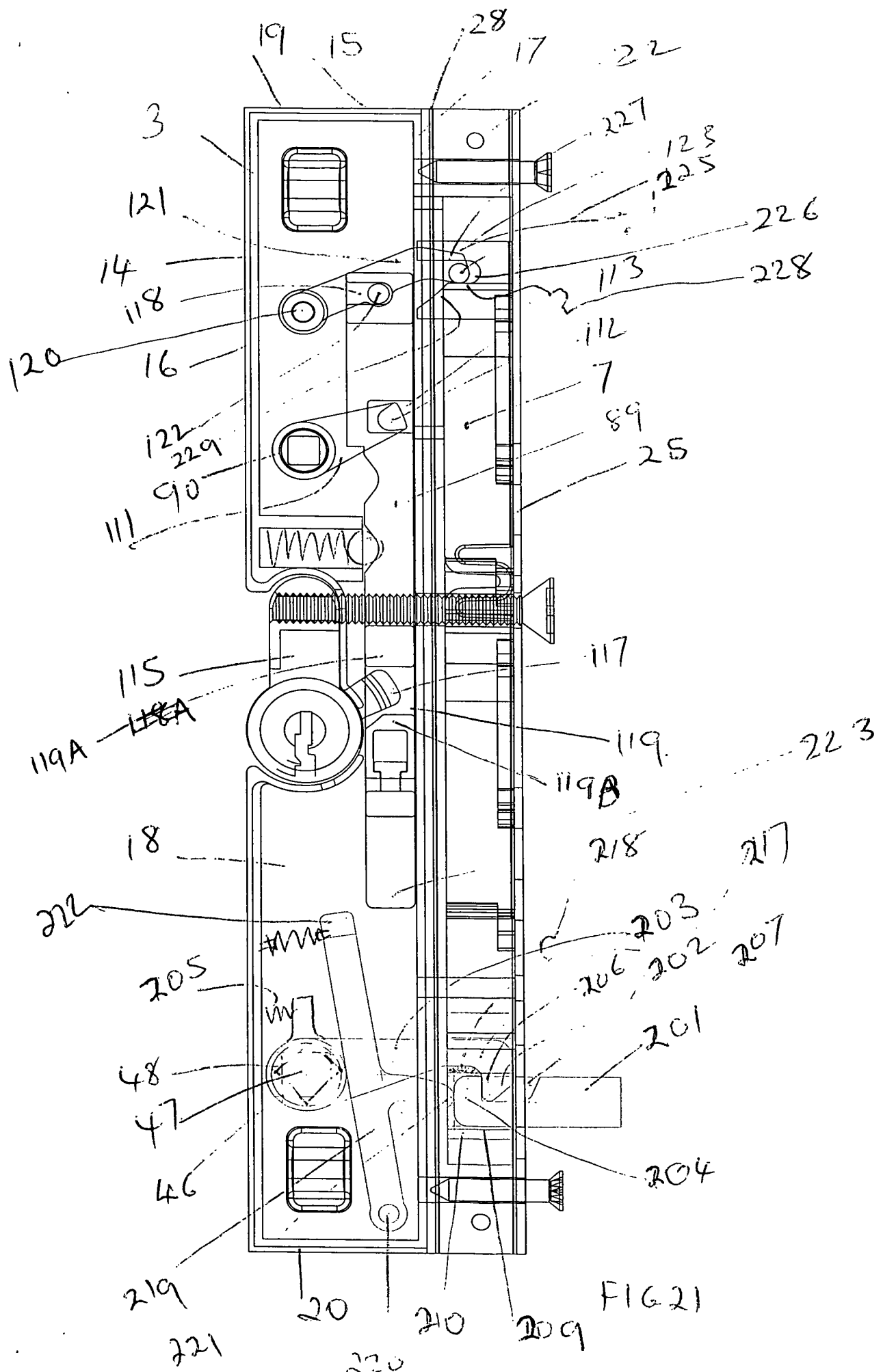


FIG 21

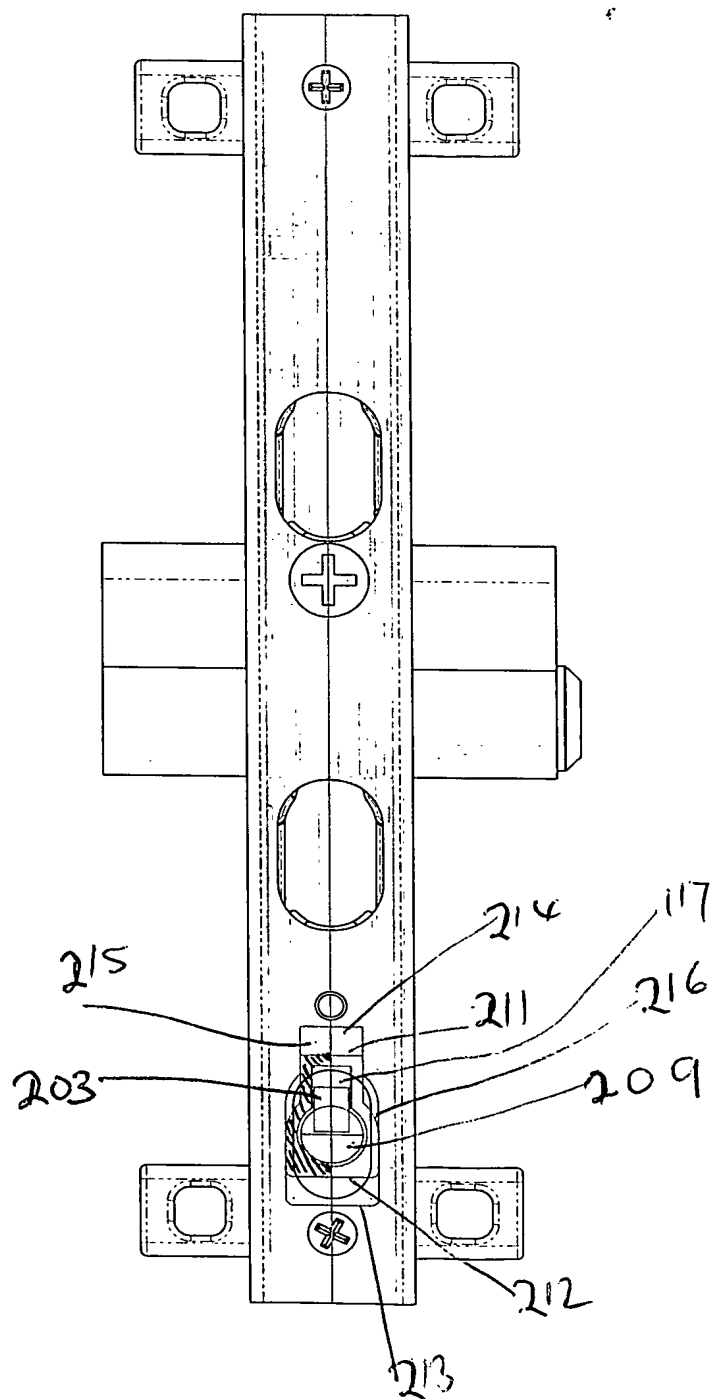
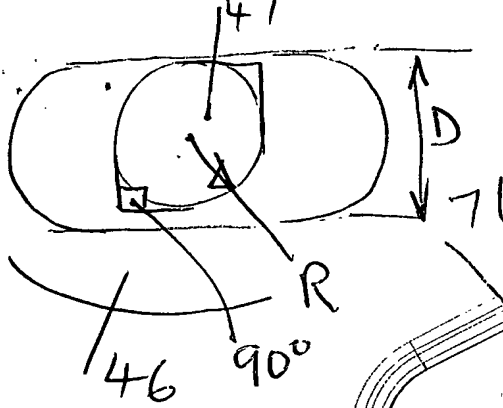


FIG. 22



$$D = 2R + 2r$$

FIG 21A

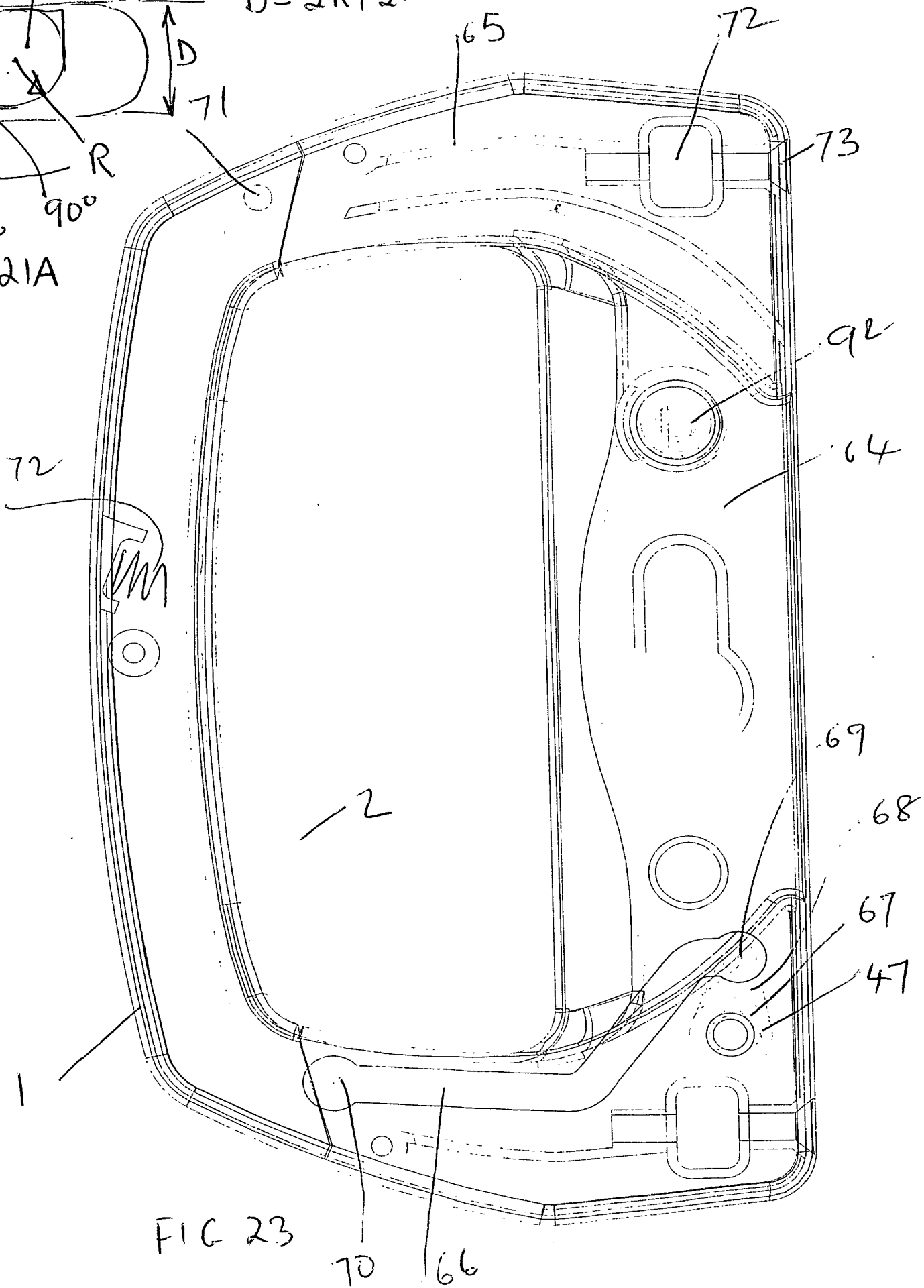
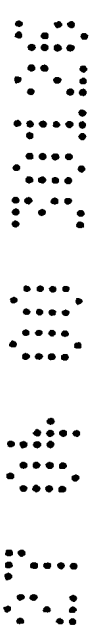


FIG 23



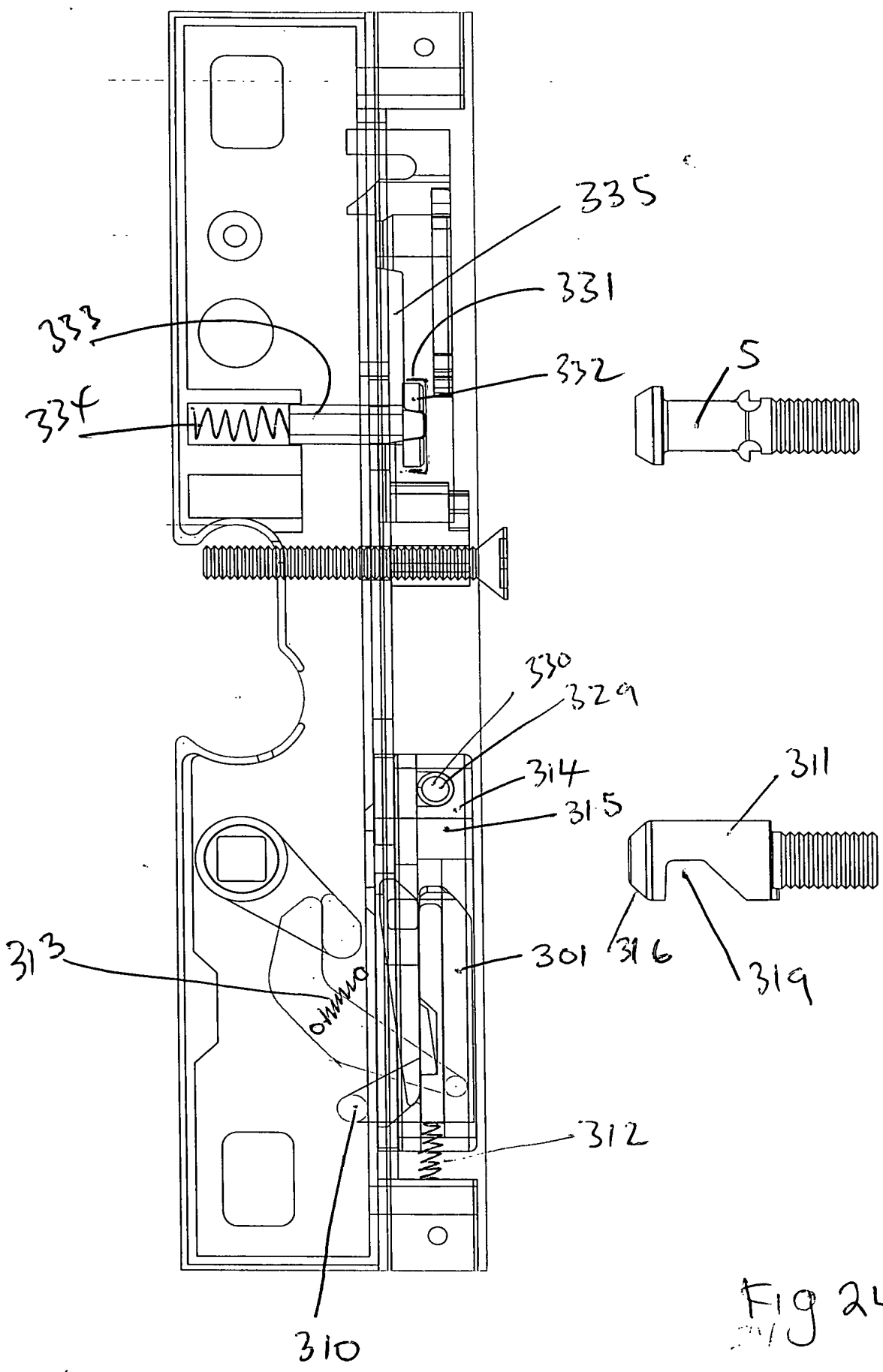


Fig 24

FIG. 25

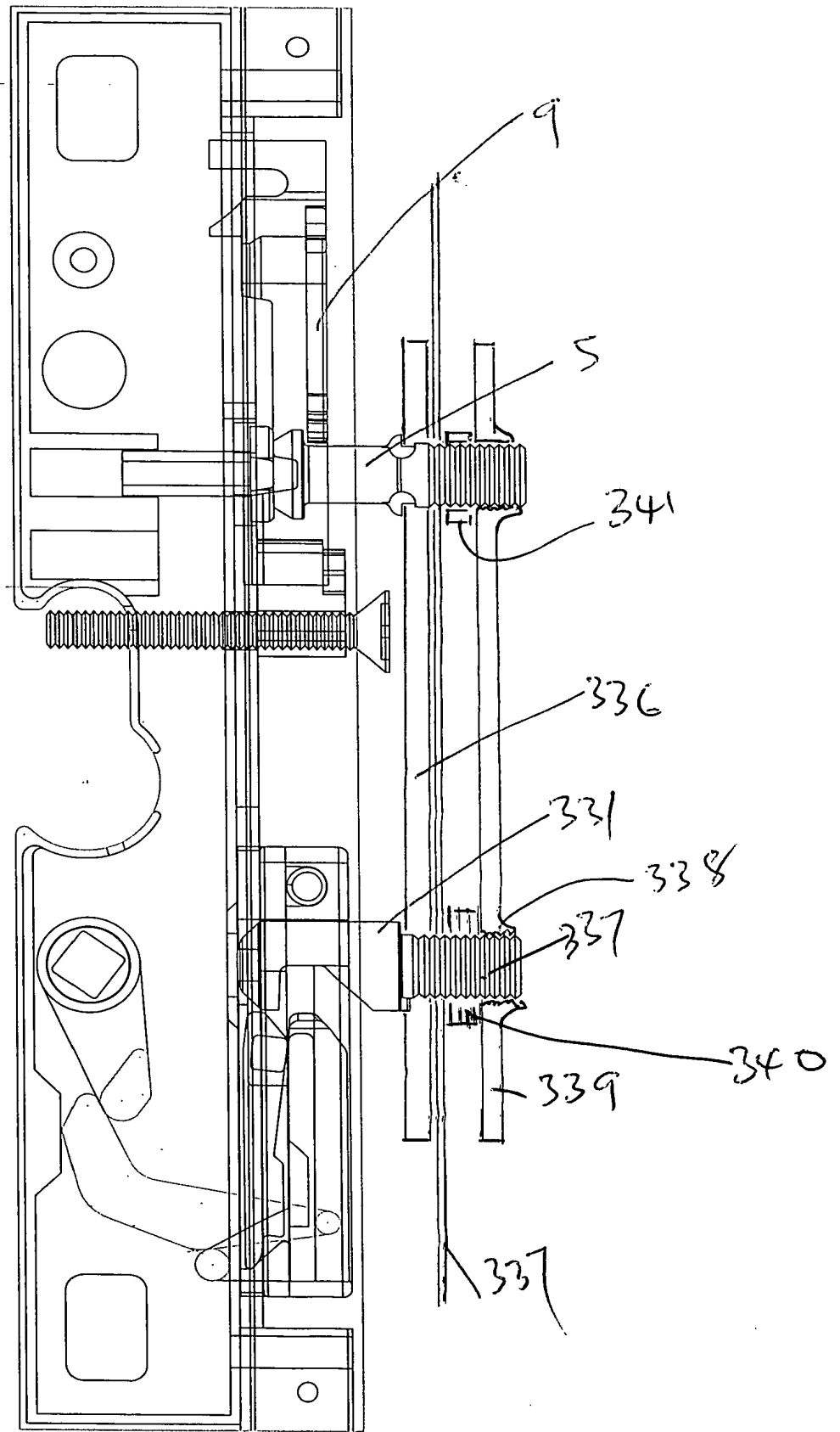


FIG 25

FIG. 26

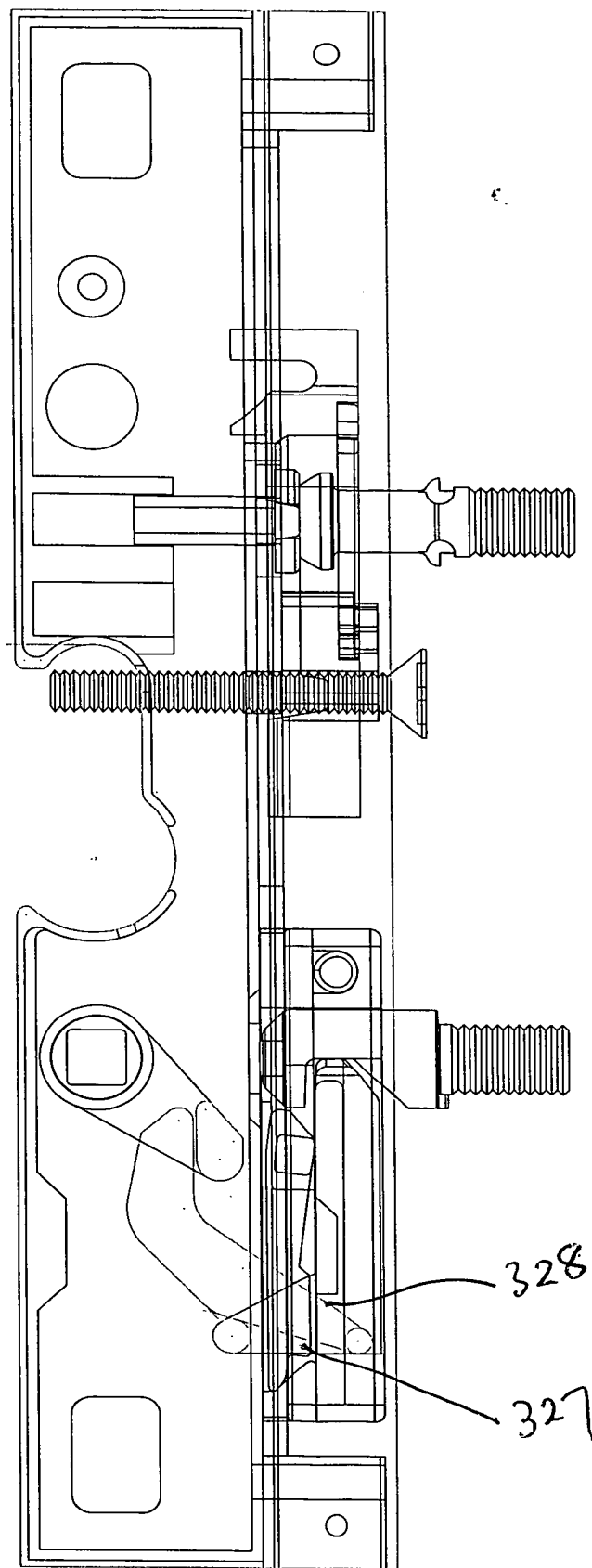


FIG 26  
2.6

